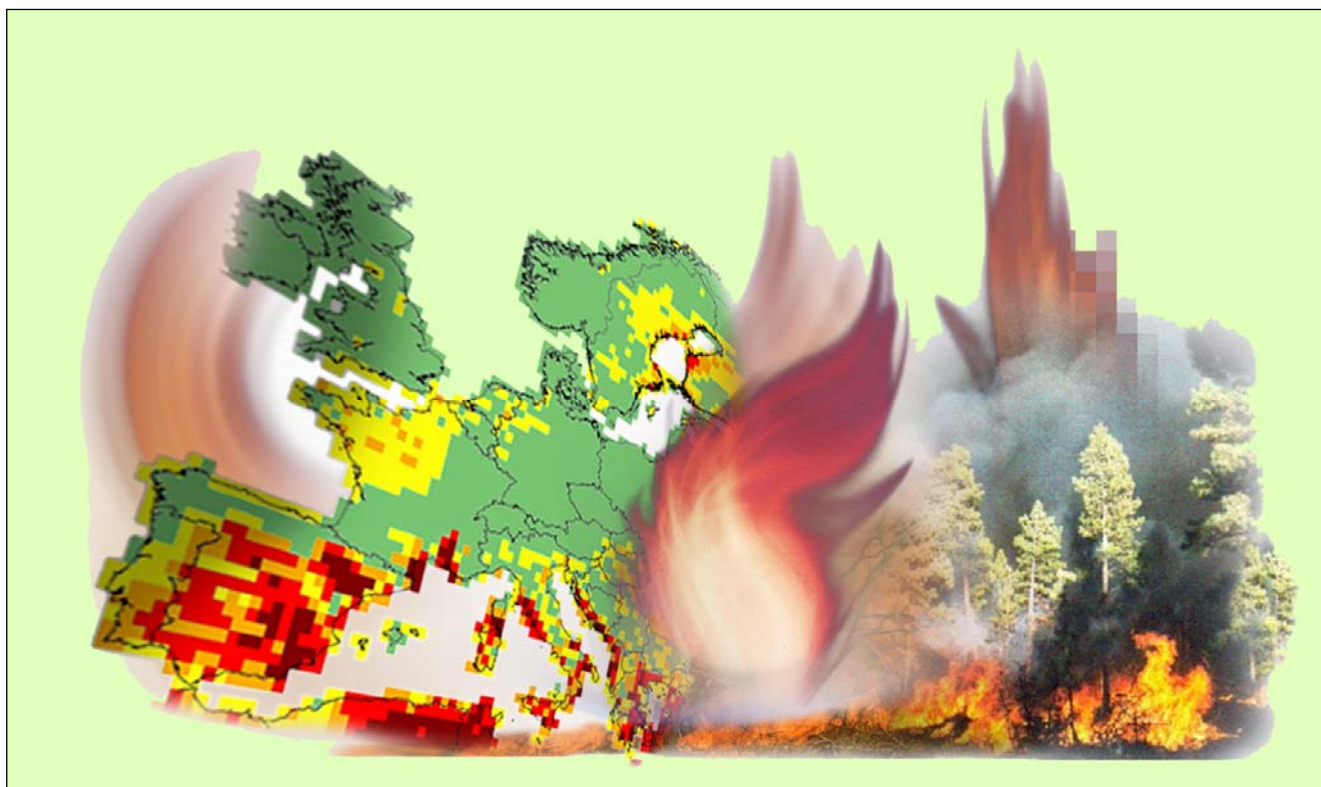


Report No 9

# Forest Fires in Europe 2008



EUR 23971 EN - 2009



# Forest Fires in Europe 2008

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## **1. FOREST FIRES IN EUROPE: A CONTINUING COMMON CHALLENGE**

At the time (July 2009) of drafting the present report on the forest fires in Europe occurred in 2008, our forests are burning and citizen again became victims of disastrous fire events. The European Commission expresses its sincere condolences to the families of those who lost their lives and to those who have to suffer from personal damage caused by the fires.

The competent Commission departments continue looking for the most appropriate solutions for avoiding forest fires within the EU and neighbouring countries. In parallel, the members of its group of experts on forest fires are steadily in contact to exchange the lessons learnt from previous fires and to contribute to the European Forest Fire Information System EFFIS managed by the Joint Research Centre, which became the most efficient forecasting and assessment tool in the field of disasters.

The national competent authorities are equally doing their utmost for preventing fires and for combating them as early as possible. And together, the European Commission and the Member States continue looking for suitable and efficient ways to avoid unnecessary fire impacts. However, basic forest fire prevention measures applied so far with EU funding, including awareness-raising campaigns and training of those involved in the forest fire issue, seem not always to be applied with satisfaction, in particular in Mediterranean high risk areas. Additional efforts are to be made so that EU budget available for prevention, fire-fighting and restoration finds its most effective use.

For the future, we need to be best prepared and to stay vigilant in order to prevent fires by forecasting and assessing fire risks and holding at permanent disposal best fire-fighting equipment, as well as human resources, by launching every year awareness-raising campaigns targeting different public at risk, by using early fire detection tools at local level, by carrying out forest fire prevention measures of all kind, by mutual assistance between Member States and coordination with the European Commission's Monitoring and Information Centre and last, but not least to develop further research activities. Only then, we will be able to best protect European forests against fires.

The Report N° 9 aims at describing the fire situation in the European countries participating in EFFIS and by doing so, it contributes to understand the forest fire particularities during 2008.

## 2. FOREST FIRES 2008 IN THE EUROPEAN COUNTRIES

### 2.1. SOUTHERN MOST AFFECTED MEMBER STATES (1980 – 2008)

The long time series of forest fire data available for these 5 southern countries (Portugal, Spain, France, Italy, and Greece) justifies a separate analysis as has been the case in previous reports.

During 2008, fires in these 5 countries burned a total area of 158 621 hectares, which is not only quite below the average for the last 29 years, but it is the minimum value since 1980. The number of fires that occurred (36 192) is also well below the average and the minimum since 1990 (see Table 1 for details).

Figure 1a shows the total burnt area per year in the five Southern Member States since 1980. The statistics vary considerably from one year to the next, which clearly indicates how much the burnt area depends on seasonal meteorological conditions. Overall, 2008 was the best year of the last decades, and it was particularly positive for western countries (Portugal, Spain, France), while a bit less but still well below the average for Italy and Greece (Table 1).

Figure 1b shows the yearly number of fires in the five southern Member States since 1980. After the increasing trend during the 1990s, which was likely also due to the improvement in the recording procedures, the number of fires was stable for around one decade. The trend to decrease observed during the last years seems to continue, but this will have to be confirmed in the next years.

Figure 1c shows the yearly average fire size in the 5 countries since 1980. There is a clear difference in average fire size before and after 1990. This is roughly corresponding to the increase in number of fires after that period, and it is also partly due to the same reasons (the additional fires that are recorded thanks to the improvements in the statistical systems are the smallest ones). But it is also largely due to the improvements of the fire protection services of the countries.

On the other hand after the 1990 we have been observing periodically bad years followed by 1-2 positive years (Figure 1a and Figure 1b).

Figure 2 compares the yearly averages for burnt areas, number of fires and average fire size for the periods 1980-89; 1990-99 and 2000-08 with the figures for 2008. It shows each of the 5 countries separately and also their total. It clearly indicates

how positive 2008 was for southern Europe especially in terms of burned area. The overall figure for the five southern Member States is well below the averages of previous periods.

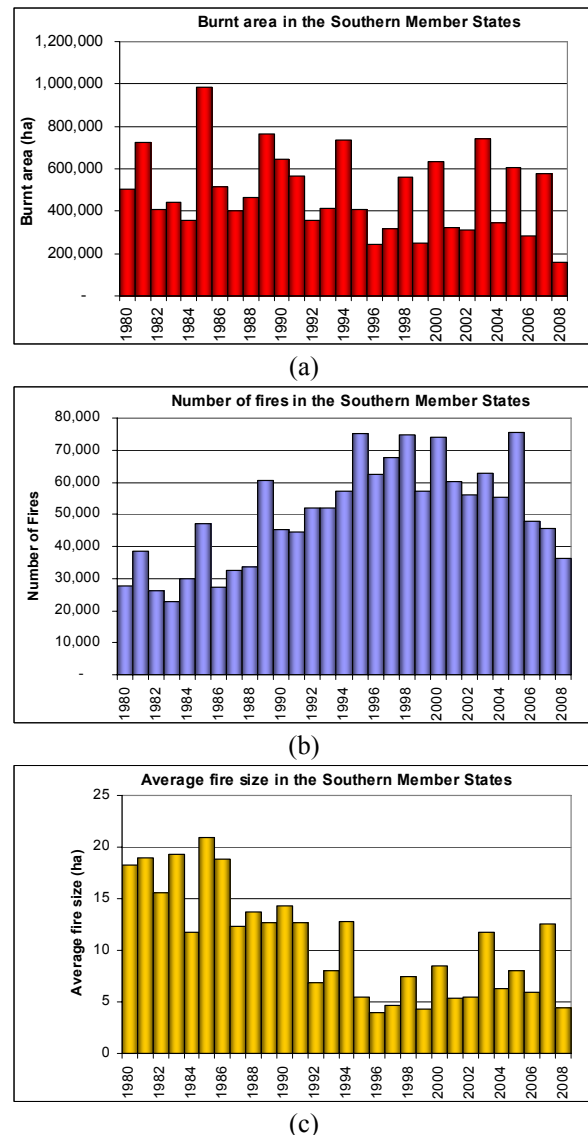


Figure 1. Burnt area (a) number of fires (b) and average fire size (c) in the five Southern Member States for the last 29 years.

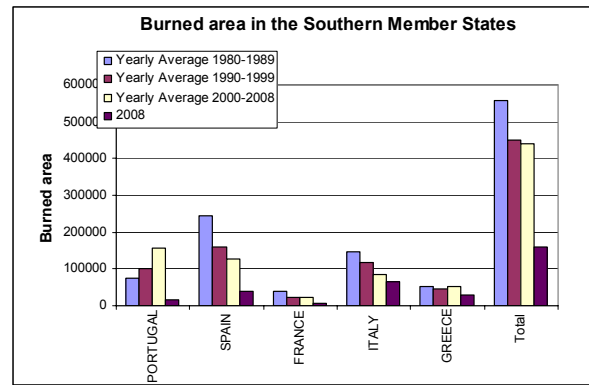
Figure 3 shows the contribution of each of the five Member State in terms of burnt areas and numbers of fires to the overall figures for all the considered Southern Member States in 2008.

Table 1 gives a summary of the burnt areas and number of fires for the last 29 years, the average for the 1980s and 1990s, and the average for the last 9 years, together with the figures for 2008.

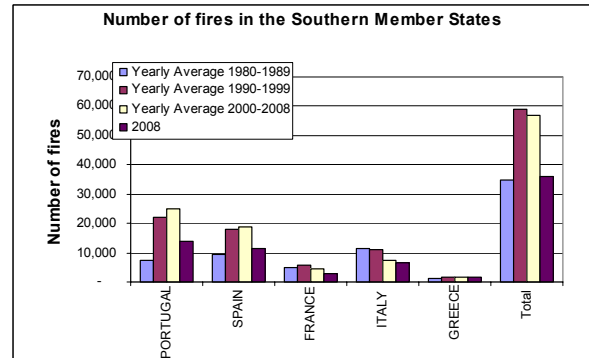
As mentioned, a total of 158 621 ha were burnt in the five southern Member States in 2008, which is the minimum value ever reached in the last 29 years. The number of fires in 2008 was 36 192, which in turn is the minimum of the last 20 years.

Since the area of each country is different, and the area at risk within each country is also different, the comparisons among countries cannot be absolute. During 2008 the share of number of fires among countries is reflecting the average share during last decades, i.e., in a relative sense the fires were distributed among countries as usual. On the other hand the burned area was concentrated in Italy and Greece more than usually (60% of the total burned area in southern Europe against an average of 35%). This indicates that the average fire size was much higher in these 2 countries, as it can be verified in Figure 2.

Over the last 8 years, the previous tendency of the five southern Member States towards an increase in the number of fires seems to be stabilized or even starting to decrease. This may possibly be due to the positive effect of the public information campaigns carried out in all the countries and the improvements in the prevention and fire-fighting capacities.



(a)



(b)

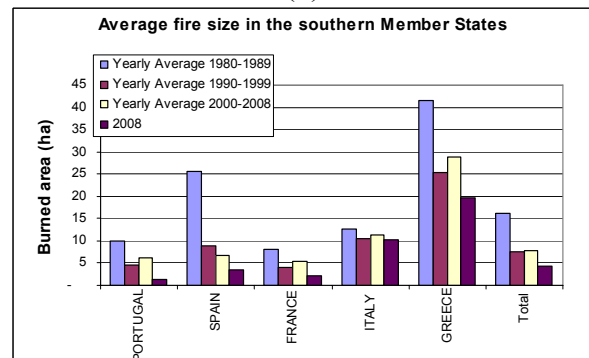


Figure 2. Burnt areas (a), number of fires (b) and average fire size (c) in the five Southern Member States in the year 2008 as compared with average values for previous decades.

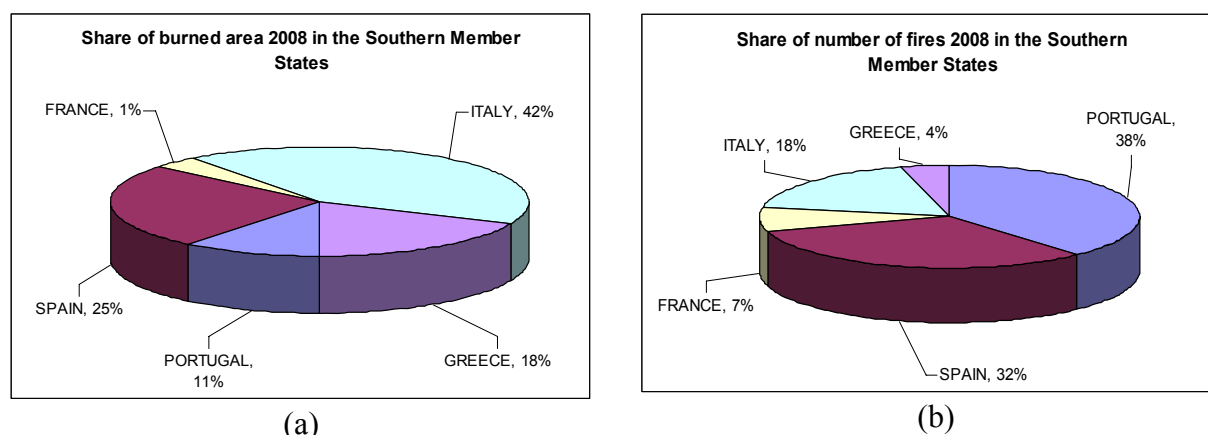


Figure 3. Share of the total burnt area (a) and the total number of fires (b) in each of the Southern Member State for 2008.

Table 1. Number of fires and burnt area in the five Southern Member States in the last 29 years.

Number of fires	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE <sup>(*)</sup>	TOTAL
2008	13 832	11 612	2 781	6 486	1 481	36 192
% of total in 2008	38%	32%	8%	18%	4%	100%
Average 1980-1989	7 381	9 515	4 910	11 575	1 264	34 645
Average 1990-1999	22 250	18 152	5 538	11 164	1 748	58 851
Average 2000-2008	24 819	18 664	4 362	7 463	1 765	57 073
Average 1980-2008	17 920	15 333	4 956	10 157	1 586	49 952
TOTAL (1980-2008)	519 686	444 647	143 731	294 555	45 995	1 448 614

Burnt areas (ha)	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE <sup>(*)</sup>	TOTAL
2008	17,244	39,895	6,001	66,329	29,152	158,621
% of total in 2008	11%	25%	4%	42%	18%	100%
Average 1980-1989	73,484	244,788	39,157	147,150	52,417	556,995
Average 1990-1999	102,203	161,319	22,735	118,573	44,108	448,938
Average 2000-2008	157,066	125,687	22,935	85,047	50,782	441,517
Average 1980-2008	109,327	179,043	28,460	118,022	49,044	483,896
TOTAL (1980-2008)	3,170,470	5,192,248	825,332	3,422,650	1,422,282	14,032,982

<sup>(\*)</sup> Provisional data for 2008.

### 2.1.1. Portugal

#### *Fire danger in the 2008 fire season*

The year 2008 was characterized by the consolidation of the National System of Forest Fires Protection. It was also a year of consolidation of the National Operational Directive of the Civil Protection for the Forest Fires Structure. In August 2008, a new forest services organizational structure was published, under the name National Forest Authority (AFN).

In 2008, Portugal showed a decrease in the burnt area<sup>1</sup> – 17 243 ha (11% of the average in the 1998 – 2007 period which has been 162 564 ha), and also in the number of forest fires, though to a less extent – 13 832 (51% of the average in the last ten years period). These figures can be explained by the combination of a cooler and rainy summer period with the adoption of policies and operational measures (such as the reinforcement of surveillance actions) and an increase in the coordination and effective use of the available fire fighting resources, especially in the initial attack. Also, in 2008, Portugal had the largest aerial fleet committed to forest fires suppression – 56 engines.

Compared to the 2007 forest fire statistics, both the number of fires and the burned area decreased in Portugal – a decrease of 26% and 45%, respectively.

This is the third year in which the target of 100 000 ha annual burnt area by 2012, established by the National Fire Plan (2006), has been accomplished.

According to the information provided by the National Meteorological Institute, Portugal experienced some rainy periods during the fire season. This fact contributed to an increase of the fuel's humidity, thus decreasing its flammability.

The meteorological Daily Severity Risk Index (DSR), derived from the Fire Weather Index, shows the evolution of the fire risk in an operational perspective for the year 2008 (Figure 4).

#### *Fire occurrence and affected surfaces*

The year 2008 followed the decreasing trend in the number of fire occurrence and burnt areas observed since 2006. Portugal registered a total number of 13 832 forest fires (81.5% of them <1ha), responsible for the burning of 17 244 ha (Figure 5). Forest fires affected mainly shrub-land (68.3%). *Eucalyptus globulus* plantations and *Pinus pinaster* stands were the forest cover most affected by fires.

Between January and June, 4 286 forest fires occurred (30.1% of the total), which affected approximately 4 640 ha (25.6% total burned area).

In the summer period (July-September, corresponding to the most critical period of forest fires) 49.2% of the total occurrences were reported, which burned about 8 850ha (51.3% of total burned area). The most severe forest fires occurred between August and mid-September.

Table 2. Forest fires in Portugal (monthly distribution).

Month	number of fires	Burned area (ha)		
		Shrub land	wooded land	Total
January	240	216	34	250
February	1 001	831	270	1 101
March	1 121	840	310	1 150
April	822	1 045	506	1 551
May	243	57	40	97
June	859	125	190	315
July	2 095	975	898	1 873
August	2 805	2 554	1 104	3 658
September	1 906	2 059	1 265	3 325
October	1 841	2 118	720	2 839
November	685	499	104	603
December	214	460	22	482
<b>TOTAL</b>	<b>13 832</b>	<b>11 781</b>	<b>5 463</b>	<b>17 244</b>

<sup>1</sup> Portugal shows a decrease in the annual burnt area records since 2005, when the Government, after the fire season, settled a reform on the national system for forest fire prevention and suppression, including the adoption of the National Fire Plan in May 2006, with the goal of 100 000 ha burnt annually by 2012.

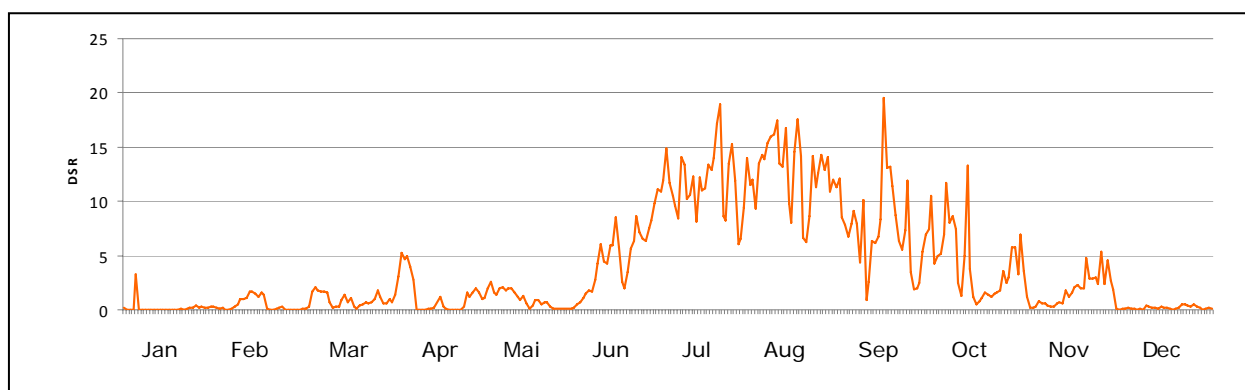
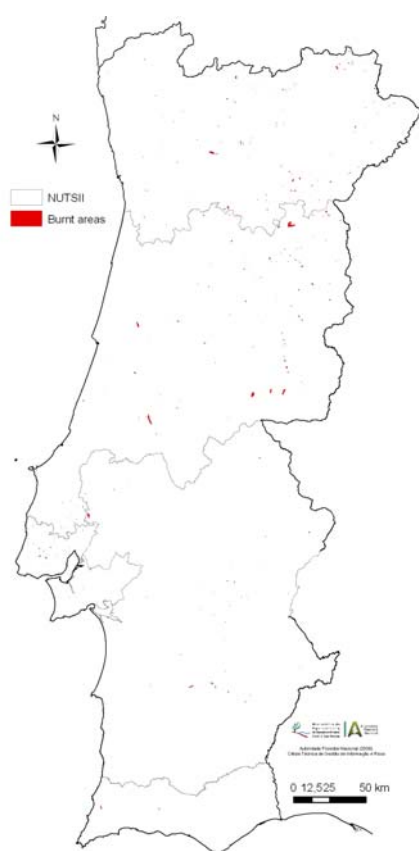


Figure 4 - DSR variation in 2008

Figure 5. Burnt areas in 2008 in Portugal.  
Source: ISA/DEF (2008); AFN (2008)

stands and are mainly mountainous areas, where the usage of fire for renewal of shrub pastures still has a strong prevalence.

Table 3. Number of fires and burned area in Portugal (NUTSII - 2008).

NUTS II Region	Number of fires			Burned Area (ha)		
	≥ 1ha	< 1ha	Total	Shrub land	Wooded land	Total
Norte	5 833	1 453	7 286	6 231	2 043	8 274
Centro	3 587	805	4 392	4 768	2 579	7 346
Lisboa	1 053	162	1 215	427	167	594
Alentejo	352	96	448	180	564	744
Algarve	450	41	491	175	111	285
<b>TOTAL</b>	<b>11 275</b>	<b>2 557</b>	<b>13 832</b>	<b>11 781</b>	<b>5 463</b>	<b>17 244</b>

The analysis of the yearly trends in the number of fires and burnt areas in Portugal shows a decrease in the last three years for both parameters, after a strong increase, especially in the burnt area, occurred in the first years of this decade (Figure 6c).

In the month of October, 2 838 ha burned were reported in Portugal (16.4% of the total), which made a significant contribution to the 2008 records.

Fire occurrence (Table 3) was distributed mostly in the urban districts, such as Porto, Braga, Aveiro (Northern region) and Lisboa, which registered 52% of the total number of fires (mainly very small fires). The Northern and Central regions of Portugal were the most affected by forest fires (15 620 ha - 90% of total). Those regions contain the main concentration of *Eucalyptus* and Pine

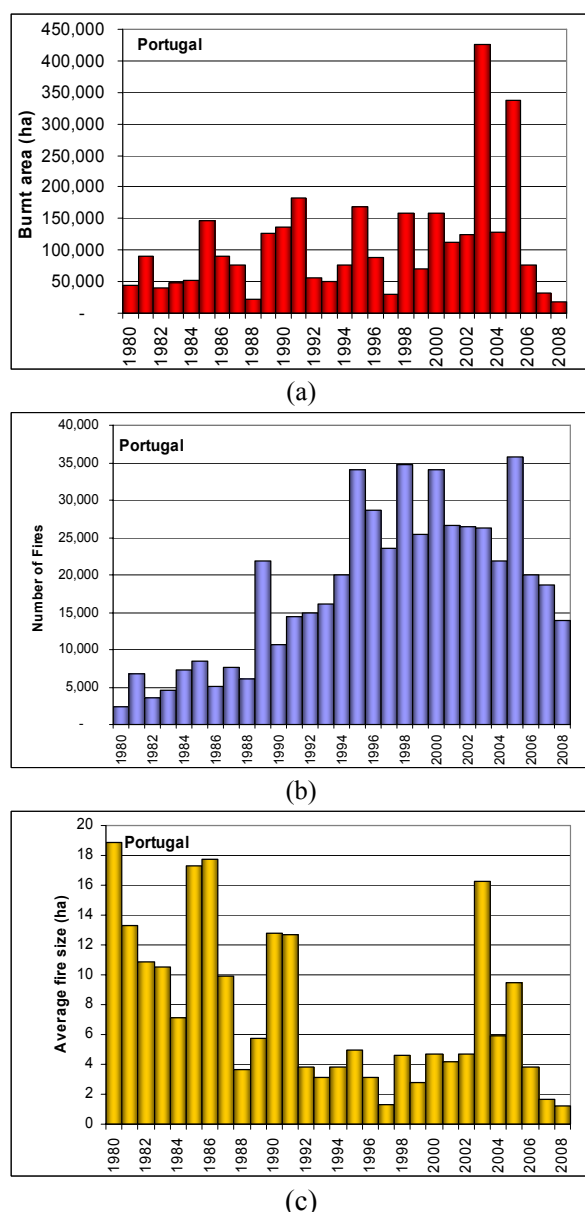


Figure 6. Burnt areas (a), number of fires (b) and average fire size (c) in Portugal for the last 29 years.

Portugal registered 18 large fires (> 100 ha), which corresponded to 27% of the total burned area. There were two fires larger than 500 ha, which burned 1 157 ha. The largest fire of 2008 occurred in the Santarém district, with 622 ha, between 12<sup>th</sup> and 13<sup>th</sup> September.

#### *Fire fighting means and information campaigns*

For the forest fire season 2008, the Portuguese Authorities significantly increased the number of means available for surveillance, detection and fire-fighting operations.

The distribution of these means during the year of 2008 was made in phases. The number of means applied in each phase depended, amongst other factors, on the forest fire risk expected for a given

period. For example, during the most critical period, Charlie Phase (1JUL-30SEP), there were around 9 514 human resources, 2 249 vehicles and 56 aerial means available.

In order to improve and assure the fire fighting operations outside the critical period, for the year of 2008, compared to 2007, a new phase, Echo Phase, was introduced. During this phase, as for the Alpha phase, aerial means are made available whenever necessary.

In the table shown below, there is a summary of all the fire-fighting means distributed by phases:

Table 4. Fire-fighting means available per phase

<i>Phases</i>	<i>Elements</i>	<i>Vehicles</i>	<i>Aerial Means</i>
<i>Alfa</i> (<15MAY)	Means available on demand		2 - 7
<i>Bravo</i> (15MAY-0JUN)	6 651	1 593	30
<i>Charlie</i> (1JUL-30SEP)	9 514	2 249	56
<i>Delta</i> (1OCT-15OCT)	3 952	917	26
<i>Echo</i> (>15OCT)	Means available on demand		2 - 7

With respect to aerial means they were of the following types:

- 35 Helis for initial attack;
- 14 Aircrafts for initial attack;
- 5 Helis for enlarged attack;
- 2 Amphibious aircrafts for enlarged attack

All means were guaranteed by different public and private entities/organizations (around 11) such as the National Authority for Civil Protection (ANPC), Fire Fighter Units, National Guard (GNR), General-Directorate for Forest Resources (DGRF), Biodiversity and Environmental Conservation Institute (ICNB), Police (PSP), Army and Forest Producers Associations (AFOCELCA).

In the case of Fire Fighter Units they were responsible for the development of around 11 914 forest fire fighting operations, covering all the Continental Portugal districts (18), with a Force of around 4 949 fire fighters.

There was also a group of special teams that developed missions mainly related to surveillance, detection and initial attack actions. Their performance in the scope of the Special Structure to Fight Forest Fires (DECIF) should be highlighted, as they contributed to the decrease in

the number of fires and the total burnt area during the year of 2008. Their actions allowed the surveillance of suspicious activities, the early detection of forest fires and the on-time development of initial attack actions. They were the Relief, Protection and Intervention Group (GIPS), the Special Fire Brigade Force (FEB) and Fire Analysis and Utilization Group (GAUF).

In the case of the GIPS, dependent on the National Guard, this Force had around 560 elements, distributed among 11 districts. They performed around 4 295 initial attack missions (3 081 airborne and 1 214 terrestrial), as well as around 4 741 terrestrial patrols.

With respect to the FEB, dependent on ANPC, it had around 215 elements distributed among 7 districts, and they developed approximately 2.640 initial attack missions (1 705 airborne and 935 terrestrial), as well as 230 pre-positioning missions.

Finally, the GAUF, dependent on DGRF, with 22 experts acting all over the country, intervened for 38 occasions.

Besides the already described significant increase in means available for surveillance, detection and fire-fighting operations and missions developed, there were some other improvements during this year in terms of fire-fighting strategy:

- Creation of 35 Heli-crews for Initial Attack, composed only by professional personnel;
- The Portuguese Government became owner of 5 Heavy HeliBombers “Kamov” that were used in Enlarged Attack Operations;
- Management of all aerial means employed in forest fire operations started to be done by a single government entity (EMA – Aerial Means Agency).

#### *Loss of human lives in the 2008 fire campaign.*

Forest fires in Portugal caused, during 2008, the death of 3 civilians. One of them was caught by fire when performing soil renewal actions and the other two were caught by the fire spread.

It should be noted that all of the deaths were due to spring/autumn fires.

#### *Operations of mutual assistance*

During 2008 Portugal did not require assistance through the EU Mechanism for Civil Protection.

However, during the season the bilateral agreement with Spain was activated for reinforcement of aerial fire-fighting in and outside the border area (15 km to each side of the border).

#### *Fire causes*

In 2008 the National Guard proceeded with the criminal investigation of 6 781 forest fires (49.4 % of the total of forest fires registered in 2008). The most probable cause of the fire was determined in 54% of the investigations. Intentional or Deliberate fires corresponded to 42% of the determined causes and Accidents or Negligence were present in the ignition of 58.6% of the human-caused fires (Figure 7). Pasture renewal and agricultural burnings represented 83% of the fires by accident or negligence.

#### *Forest focus C-Studies*

In 2008, Portugal funded a set of new studies under the “Forest focus” national program, taking in consideration the main results of the study developed in the Forest Focus Program 2003-2004. The studies performed in 2008 can be divided into three main categories: global studies, thematic studies and case studies.

**Global Studies:** “Forest fires in Portugal: a critical analysis five years after 2003” and “Perceptions of the Portuguese population about forest fires and its causes (market survey)”

**Thematic Studies:** “The socio-psychological profile of the forest fires arsonist (2008 up-date)”;

“The problem of the wildland/urban interface in forest fires prevention” and “The relation between forest fires and pastoralism”.

**Case Studies:** “The usage of fire for pasture renewal in Montalegre municipality - a sociological and biophysical approach” and “The forest fires ignition with origin in the railroads”.

#### *Policy measures*

##### *a) Decree-Law 124/2006*

The Decree-Law 124/2006 establishes a set of preventive measures for forest fire prevention. In 2008, with the publication of the Regulation 566/2008, the critical period between 1st July and 15th October was established, where special preventive measures prevailed.



*Special Committee for the Evaluation of the Portuguese Policy for Forest Fires Prevention and Suppression (National Parliament)*

The Portuguese Parliament, following the previous Special Committee recommendation, established in May 2007 a Special Committee for the evaluation of the Portuguese Policy for Forest Fires Prevention and Suppression. This Special Committee was comprised 23 members of the National Parliament who conducted an analysis of the implementation of the policy by the Government in 2007. The final report was approved by this Special Committee in March 2008.

*National Fire Plan*

The 2007/2008 evaluation of the National Fire Plan was requested to an independent consultancy firm, which had made the 2006 evaluation.

*Bilateral Commission on Forest Fires Prevention and Suppression (Portugal/Spain)*

There were no follow-up progresses in the Commission works.

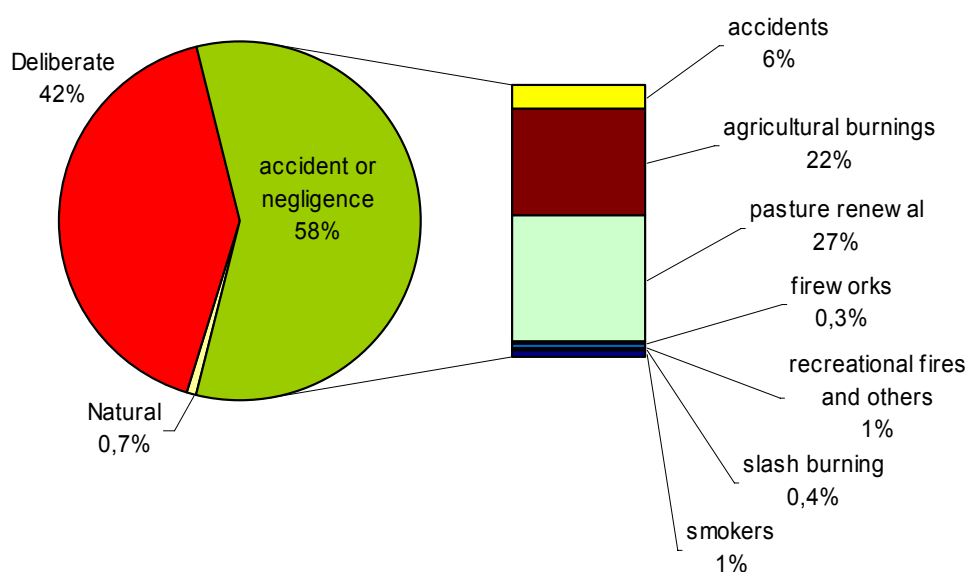


Figure 7. Main causes of forest fires in 2008

*Forest fire prevention and information campaigns*

**(a) Information and Public awareness campaigns**

Portugal developed a public awareness campaign for forest fire prevention under the slogan “Portugal without forest fires depends on all of us”. Under funding by the National Forest Fund, several actions were taken, following four main strategic axes:

- 1) National awareness campaign in the media, warning for risky behaviours, promoted by the National Authority for Civil Protection and the National Forest Authority;
- 2) Informative sessions to target-groups (farmers, forest owners and shepherds), developed by the National Forest Authority in

cooperation with forest owners and farmers’ organisations;

3) “Tree parade 2008”, a national contest for schools promoted by the National Forest Authority in collaboration with the Ministry for Education, which involved 165 schools (300 teachers and 8000 students). The works were exhibited in Lisboa, Porto, Coimbra, Évora, Faro, Santa Comba Dão, Loures, Torres Vedras, Santarém, Penela, Portel and Vizela;

4) “Florestarte”, an itinerant exhibition for public awareness on forest protection was set up in several cities. This exhibition shows a large stand with 1 000 posters (national and international) with information about the importance of forest conservation.

In the public information domain, the National Authority of Civil Protection and the National Forest Authority made significant efforts on the availability of on-line information. To reach this goal, the AFN published eight reports on-line between 8th July and 15th October (critical period) and the Civil Protection services displayed on-line information about the most relevant forest fires incidents. Also, the Meteorological Institute provides online information concerning the FWI and its forecast. The National Forest Authority also provides its partners with an online service for FWI mapping.

## **(b) Forest Fire Prevention**

### **(b).1 Forest fire planning**

The General National Forest Authority kept its efforts in the forest fire planning at the local, municipal and regional (district) levels.

The municipal planning objective is pursued by the technical support to the forest offices of the municipalities, based on the Municipal Plans for Forest Fire Prevention (5 years planning) and the Municipal Operational Plans, which are part of the previous plans and which are updated on a yearly basis.

The municipalities' forest offices provide technical support to the Municipal Commission for forest fire prevention and suppression. By the end of 2008 there were 210 municipal forest offices established (188 municipal and 20 inter-municipal) and 245 Municipal Plans for Forest Fire Prevention and 257 Municipal Operational Plans approved. 88% of the municipalities are covered with Forest Fire Prevention Municipal Plans.

The regional level planning is assured by the Regional Forest Plans (for the entire continental land) and by regional maps of fire pre-suppression, updated each summer in cooperation with municipalities and Civil Protection Agency, at the district level.

### **(b).2. Forest fuel management**

Forest fuel management is one of the key-actions in the forest fire prevention domain. A total area of 14 522 ha was managed: 13 348 ha by specialized hand-crews and 1 174 ha with prescribed burning (137 ha forest stands and 1 037 ha shrubland). The prescribed burning was performed under the national programme GeFoCo, an AFN programme to provide technical support to the field operations.

By the end of 2008, Portugal had 106 foresters and 100 personnel of the specialized hand-crews trained in prescribed burning.

## **(c). Forest fires operational prevention**

The National Guard is responsible for the coordination of the surveillance of critical forest areas, detection of forest fires, for law enforcement and the initial criminal investigation of forest fires.

### **(c). 1. Surveillance and detection**

The National Guard deployed the "Secured Forest Operation", between 15th May and 15th October, which promoted the realization of over 66 700 patrolling operations in the most critical forest areas. These patrolling operations represented 54% of a total of 122 668 operations.

In 2008, the National Guard finished the process of modernization of the Lookout Towers National Network, with the replacement of some of the old metallic structures by the last 12 new towers. By the end, a total of 64 lookout towers were replaced, representing 26.7% of the 240 Lookout Towers National Network. A significant part of the detection of forest fires in 2008, was made by the population (43% of the alerts), using their mobile phones to contact the emergency number 112 (European emergency number). In 2008, Portugal stopped using the emergency number 117, used specifically for forest fire alert.

### **(b).3. Law enforcement**

The application of the preventive measures defined in the Decree-Law 124/2006 was the main action of the National Guard. A total of 4 869 infractions were detected, mostly related to illegal agricultural use of fire and the lack of vegetation clearance around houses, keeping the same trend of 2007.

### **(b).4. Fire fighting strategy**

In order to cope with forest fires and to define an integrated fire-fighting strategy, the Portuguese National Authority for Civil Protection (ANPC), as it did in 2007, established an Operational Directive for the forest fire season of 2008, with the following main purposes:

- Define a unique structure for Direction, Command and Control, and a Special Structure to Fight Forest Fires (DECIF);
- Regulate institutional coordination and the cooperation and involvement of the organizations belonging to the Portuguese

### Integrated System for Relief Operations (SIOPS).

The Operational Directive was applied to all organizations and institutions which play a role in this field and was used as a base to elaborate both district and municipal emergency plans. It was also used as a reference to elaborate all directives, plans and orders that were applied to organizations involved in the Special Structure to Fight Forest Fires (DECIF).

The Directive defined an operational concept based on the following principles:

- Unique command structure;
- Anticipation ability;
- Integrated response;
- Permanent safety.

and had the following objectives:

- Dissuasive surveillance;
- Well-timed detection;
- Immediate dispatch;
- Strong initial attack;
- Unity of command;
- Operation maintenance.

In order to accomplish all the above-mentioned objectives a time-line for operational response was defined, with the following main steps:

- **Anticipation**, which involved pre-positioning of surveillance and initial attack teams, as well as fire-fighting, back up and specialized teams; aircrafts were employed in armed monitoring operations;
- **Initial Attack**, which implicated immediate dispatch of the initial attack resources, especially the aerial ones. Other foreseen activities were reconnaissance and initial evaluation of the situation, transfer of command so that the operations could be correctly organised, and permanent guarantee of recovering the structure's initial attack capacity. So, this phase is a first organised and integrated intervention.
- **Enlarged Attack**, which implied immediate reinforcement of operations, in accordance with the principle of subsidiarity and also of anticipation, ensuring the necessary tactical decisions to defend forest and houses, and activation of different teams such as fire analysis or/and tactical restraint fire teams. The activation of an Enlarged

Attack depends on the following: if after 90 minutes, the fire is not extinguished or declared circumscribed by the incident commander, the District Coordination Centre forwards reinforcement groups.

- **Post-Fire Operations and Active Surveillance**, which implied the elimination of all living embers and isolation of the material in slow combustion, in order to prevent the fire becoming active again.

*(Sources: Ministry of Agriculture, Rural Development and Fisheries - National Forest Authority and National Authority for Civil Protection, Portugal)*

### 2.1.2. Spain

#### *Fire danger in the 2008 fire season*

A very dry winter was followed by a wet spring, resulting in humidity in the soil and vegetation that lasted until mid July. During the summer, precipitations were frequent in the Northern part of Spain, thus restricting the fire danger and deterring the use of fire which is often utilized in this zone even though forbidden during the period of highest fire danger. In other parts of Spain, summer rain was scarce until September and consequently the fire danger was high. Since in general there was no strong wind, the fire danger increased to the extremely high level only for a few days.

#### *Fire danger month by month*

January was a very hot month throughout the country, exceeding by 1.7°C the average values of the reference period, being particularly hot in Canary Islands. In relation to precipitations, the values were normal but variable depending on the region: Balears and Canarias were dryer, while the west part of Galicia, north of Guadiana, Middle and High Guadalquivir, High Douro and Júcar and middle areas of Ebro were very humid.

With these atmospheric conditions, fire danger was low in January, except in Ebro's valley and the eastern and southwest areas, between the 22<sup>nd</sup> and the 25<sup>th</sup>. There were 770 occurrences during this month, more than the average 1998-2007 (513) but the burnt area was lower. The available means consisted of two CL-215T planes in Torrejón de Ardoz (Madrid), two CL-215 in Matacán (Salamanca) and a Kamov helicopter in Muchamiel (Alicante) from the 16<sup>th</sup> of January. The EPRIF ("*Equipos de Prevención Integral contra Incendios Forestales*") are operational between November and April and participated in the suppression of fires in Orense and Cabuérniga.

February was considered a very hot month in the majority of the Peninsular territory, more intense in the NW of Galicia and in the low areas (curso bajo) of Guadalquivir. The values of precipitation were normal in most of the peninsular area and in the Canary Islands, dry in the northern areas, Ebro and Balears and very dry in South Western Galicia, Asturias, Bask Country and north of Navarra. Fire danger levels were low during this month, except for the northwestern provinces due

to low precipitation and the sometimes strong southern winds, which increased fire danger to moderate level.

Besides the means available in the previous month, the BRIF-I bases of Pinofranqueado (Cáceres), Tineo (Asturias), Riente (Cantabria) and Tabuyo del Monte (León) were open, the latter two including a Kamov helicopter. The number of occurrences during this month – 3 269, was higher than the average in the period 1998-2007 (1 989) and the burnt area was also exceeded by 4 037.89 ha.

March registered slightly higher temperatures in relation to the reference period, as well as dry conditions. Precipitation was irregular in terms of spatial distribution, with a large difference between the north and the south of the peninsular territory. Fire danger was low except in Galicia, Cantabrian coast, Ebro's valley and Eastern side, due to an absence of precipitation and the occurrence of dry (desiccant) winds, similarly to February. The means available included, in addition to the previous months, the Laza base (Orense) with a BRIF-i and a Kamov helicopter.

April was a very hot month in most of the territory, particularly in the provinces of Valencia, Murcia and the Canary Islands. Precipitation was irregular, with the Atlantic areas recording higher values and the Mediterranean and islands being dry to very dry. During this month the BRIF-i and the EPRIF were deployed. The total number of fires was similar to the average of the reference decade and the burnt area was lower. There were two big fires during this month, one in Porto (Zamora) which burned 650 ha of forested areas and another in Hermigua (La Gomera). For the latter, 3 CL-215T planes of the Torrejón base and two Kamov helicopters from Muchamiel base were used.

In May the values of precipitation were higher than normal, being extremely wet in north Meseta and Ebro's valley. Temperatures were normal, except in the northern region of the Peninsula (excluding Barcelona) and the Canary Islands, where they were higher. Due to high precipitation levels, fire danger levels were low in the whole territory and there were no fire occurrences registered. Nevertheless, two Amphibian Planes (AA) from Matacán (Salamanca), two others from the Torrejón base (Madrid) and a helicopter with a capacity of 4 500 l in Muchamiel base (Alicante), were available to assist the Autonomous Communities.

In June, temperatures were relatively normal, except in the Canary Islands (Tenerife) which showed areas with cold conditions even though the average weather conditions were warm to hot. Rainfall was irregular both in space and time; the Balears Islands, the northeast of the peninsula and the middle areas of Tagus and Douro were humid, while Southwest Galicia, Andalucía and the area between the two Atlantic zones were dry to very dry. During this month, the deployment of the Summer suppression means began, with 11 AA, Aa, 7 HK, 8 BRIF-A and 1 BRIF-B from the 16<sup>th</sup> of June. The bigger fire, which burned 416.91 ha according to MODIS images, occurred in Tarifa (Cádiz) during the 18<sup>th</sup> and 19<sup>th</sup> of June and required the intervention of 3 FOCAs and 3 Kamov of MARM.

July was an average month in terms of temperature, except in Canary Islands where temperatures were higher. In relation to rainfall, it was a dry month, except for La Coruña, Segovia, South of Cataluña and some areas of Andalucía, which were very humid. During this month, the suppression means of MARM intervened in 228 occurrences.

August was a hot month for the majority of the country, except in Galicia where conditions were colder and in the Canary Islands where it was very hot. The North and Northwestern parts of the country were wet and the rest of the country was dry. This month registered the higher number of interventions by the MARM suppression means, with 1 770 occurrences and 2 784 ha of burnt forest area. Between the 5<sup>th</sup> and the 10<sup>th</sup> August, there was a big fire in Zuera (Zaragoza), which burned 2 500 ha of forest.

September was a cold month, except in Mallorca, Málaga, Murcia and some Canary Islands where it was hot. Rainfall was irregular, average in the north and wet in the south and Canary Islands. There were 235 occurrences during this month. Two CL-415 planes from the Torrejón base were sent to Bulgaria through the European Civil Protection Mechanism.

October was an average month, with colder conditions in the regions of Valencia, Canary Islands, San Sebastian and La Coruña. Rainfall values were above average. There were 61 occurrences which required the intervention of the MARM means.

November was a cold and dry month throughout the country. There were two forest fires on the 17<sup>th</sup> November, in Castilla y León.

December was cold across the country and rainfall reached 551/m<sup>3</sup>, an average value. On the 26<sup>th</sup> December, an AA CL-215 from Matacán (Salamanca) was used in 2 forest fires that occurred in El Rebollar and in commune of Gata (Cáceres).

### *Number of fires and affected surfaces*

The numbers of 2008, according to the data provided by the Autonomous Regions, are shown in Table 5.

The total number of forest fires in 2008 (11 612) is only slightly higher than in 2007 (10 915) and amongst the lowest in the last 20 years. Nearly two thirds of the ignitions were controlled before spreading widely while 36% of the fires were larger than 1 ha. The burnt area (39 895 ha) however, is less than half as large as in the previous year (82 048 ha) and by far the lowest since the beginning of statistical records in 1980. The second lowest burnt area was in 1996 (59 814 ha). Consequently, the average fire size is also lower in 2008 than in any year before (3.44 ha; 3.57 ha in 1996). Of the total burnt area, only 7.636 ha were dense forests, while the average of the last decade amounts to 43 298 ha and even in 2001 (the second lowest) 10 000 ha more of dense forest burnt. 28 070 ha were open forests and shrub areas, and 4 189 ha pastures and savanna areas.

At the level of Autonomous Communities, the worst hit was Castilla y León with 15 264 ha, followed by Galicia (6 353 ha) and Asturias (4 555 ha).

### *Prevention measures*

The favourable weather conditions and the prevention measures coordinated by the Autonomous Regions and the National Administration contributed to a decreased number of fires in the entire country during this summer. The following prevention activities are worth mentioning:

#### *1. Information and Awareness Campaigns*

a) a general campaign through TV, radio, press advertisement and dedicated web sites to raise awareness of the risk of forest fires and prompt its prevention;

b) a rural campaign through theatre plays in local areas including educational messages on fire prevention and the risks associated with forest fires;

c) educational campaigns in elementary and high schools.

2. The number of EPRIF teams (Equipos de prevención integral de incendios forestales/ Teams of integral prevention of forest fires) was raised from 14 to 17. The EPRIF teams are coordinated by both the MMA and the Autonomous Regions to work with the rural population in areas of high fire risk and they are widely accepted by the communities. Their aim is to raise awareness about forest fires, promote the use of prescribed fires and shrub removal, and increase knowledge about fire causes and fire suppression. If necessary, they also actively support the suppression of fires.

3. Use of satellite imagery for the location of active fires and for the mapping of burnt areas is carried out in collaboration with the EC Joint Research Centre.

4. A manual for fire protection at urban-forest interfaces and a guideline for the planning of prevention measures have been disseminated by the *Dirección General de Medio Natural y Política Forestal* (GMNPF) facilitating the planning of safety measures in urban settlements.

5. Substantial subsidies were provided by the Ministry of Environment (*Ministerio de Medio Ambiente y Medio Rural y Marino* - MARM) to the Autonomous Regions for silvicultural prevention measures, shrub removal, surveillance activities and the increase of preventive infrastructure.

#### *Operations of mutual assistance*

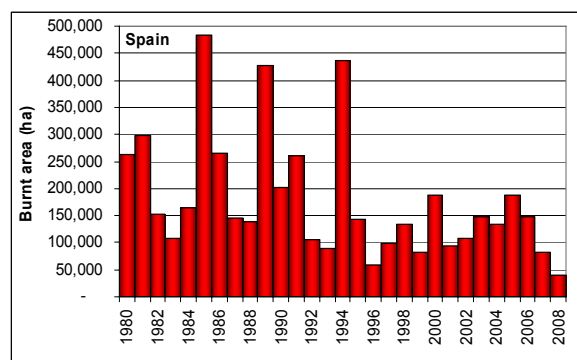
Spain provided support for forest fire fighting in Morocco and Bulgaria. The following interventions with CL-415 aircrafts took place:

Mission	Country	Flight hh:mm	CL415	Discharges
02/08/2008	Morocco	12:50	2	20
9-11 /09/2008	Bulgaria	57:40	2	128

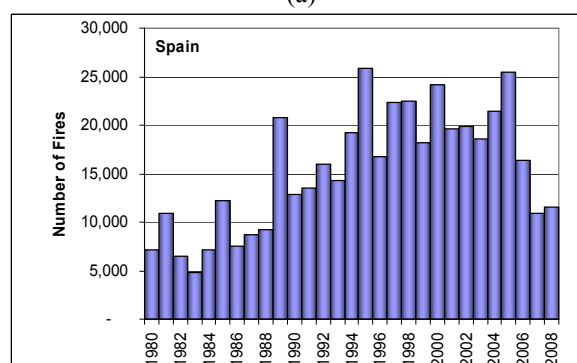
#### *Expenses*

In 2008, 30 million Euro were spent for forest fire prevention (awareness raising campaigns, fire danger forecast, studies, databases, surveillance, preventive silviculture). About 65 million Euro were spent on fire suppression against a yearly average of 44 million Euro for the last 5 years. The budget for both fire prevention and suppression has been continuously increased and has about doubled since 2003. 750 000 Euro were

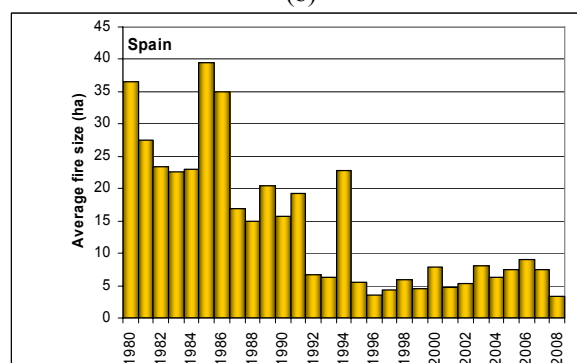
expended for international cooperation and the compensation of accidents in 2008.



(a)



(b)



(c)

Figure 8. Burnt areas (a), number of fires (b) and average fire size (c) in Spain for the last 29 years.

(Source: *Ministerio de Medio Ambiente y Medio Rural y Marino, Dirección General de Medio Natural y Política Forestal, Área de Defensa Contra Incendios Forestales, Spain*).

Table 5. Forest Fires from January 1st to December 31st 2008 (provisional data, 21.01.2009).

PROVINCIA / COM. AUTONOMA	Num. Siniestros		SUPERFICIES				% SUPERFICIE respecto a la existente	
	Conatos < 1 ha	Incendios ≥ 1 ha	Forestal Leñosa			Forestal Herbácea	% ARBOLADA	% FORESTAL
			Arbolada	Matorral y M.Bajo	Total			
Alava	20	5	1,98	9,20	11,18	21,06	0,002	0,018
Guipúzcoa	17	8	23,13	118,07	141,20	1,00	0,021	0,102
Vizcaya	21	22	37,60	26,35	63,95	1,62	0,031	0,044
<b>PAIS VASCO</b>	<b>58</b>	<b>35</b>	<b>62,71</b>	<b>153,62</b>	<b>216,33</b>	<b>23,68</b>	<b>0,017</b>	<b>0,051</b>
Barcelona	160	12	16,36	19,45	35,81	0,76	0,004	0,008
Girona	89	8	17,14	6,45	23,59	2,35	0,006	0,007
Lleida	77	23	139,76	176,60	316,36	66,40	0,035	0,053
Tarragona	54	10	19,34	22,51	41,85	0,00	0,012	0,015
<b>CATALUÑA</b>	<b>380</b>	<b>53</b>	<b>192,60</b>	<b>225,00</b>	<b>417,61</b>	<b>69,51</b>	<b>0,015</b>	<b>0,026</b>
A Coruña	300	83	194,61	360,51	555,12		0,048	0,109
Lugo	211	81	126,18	742,26	868,44		0,027	0,130
Ourense	880	469	477,82	3.870,45	4.348,27		0,147	0,748
Pontevedra	462	78	202,70	378,28	580,98		0,092	0,192
<b>GALICIA (*)</b>	<b>1.853</b>	<b>711</b>	<b>1.001,31</b>	<b>5.351,50</b>	<b>6.352,81</b>		<b>0,070</b>	<b>0,308</b>
Almería	44	20	28,40	354,80	383,20		0,032	0,068
Cádiz	53	17	150,30	825,30	975,60		0,122	0,247
Córdoba	53	8	6,20	115,60	121,80		0,003	0,020
Granada	89	30	25,30	245,80	271,10		0,014	0,046
Huelva	135	22	65,50	63,10	128,60		0,014	0,017
Jaén	118	10	5,20	67,30	72,50		0,002	0,012
Málaga	62	12	64,30	178,80	243,10		0,070	0,081
Sevilla	95	11	27,00	24,10	51,10		0,014	0,011
<b>ANDALUCIA (**)</b>	<b>649</b>	<b>130</b>	<b>372,20</b>	<b>1.874,80</b>	<b>2.247,00</b>		<b>0,023</b>	<b>0,052</b>
<b>ASTURIAS (*)</b>	<b>835</b>	<b>1.132</b>	<b>298,87</b>	<b>4.256,21</b>	<b>4.555,08</b>		<b>0,092</b>	<b>0,683</b>
<b>CANTABRIA</b>	<b>31</b>	<b>176</b>	<b>668,15</b>	<b>1.358,65</b>	<b>2.026,80</b>	<b>83,50</b>	<b>0,427</b>	<b>0,653</b>
<b>LA RIOJA (*)</b>	<b>75</b>	<b>23</b>	<b>8,95</b>	<b>84,99</b>	<b>93,94</b>		<b>0,008</b>	<b>0,032</b>
<b>MURCIA (*)</b>	<b>100</b>	<b>15</b>	<b>18,14</b>	<b>138,91</b>	<b>157,05</b>	<b>8,12</b>	<b>0,015</b>	<b>0,056</b>
Alicante	71	15	44,91	72,86	117,77	2,05	0,073	0,048
Castellón	67	6	17,60	18,14	35,74	277,48	0,012	0,078
Valencia	157	25	231,51	54,72	286,23	22,53	0,082	0,054
<b>COM. VALENCIANA</b>	<b>295</b>	<b>46</b>	<b>294,02</b>	<b>145,72</b>	<b>439,74</b>	<b>302,06</b>	<b>0,060</b>	<b>0,061</b>
Huesca	70	23	23,85	52,15	76,00		0,006	0,009
Teruel	63	16	23,74	42,78	66,52		0,006	0,007
Zaragoza	125	48	1.945,76	380,02	2.325,78		0,986	0,325
<b>ARAGÓN (*)</b>	<b>258</b>	<b>87</b>	<b>1.993,35</b>	<b>474,95</b>	<b>2.468,30</b>		<b>0,201</b>	<b>0,100</b>
Albacete	65	8	15,41	9,61	25,02	6,36	0,007	0,005
Ciudad Real	45	48	24,95	175,32	200,27	877,08	0,024	0,130
Cuenca	134	27	29,80	32,74	62,54	96,69	0,006	0,019
Guadalajara	172	43	31,59	59,44	91,03	53,97	0,011	0,020
Toledo	113	67	80,82	81,02	161,84	411,67	0,150	0,135
<b>CASTILLA LA MANCHA</b>	<b>529</b>	<b>193</b>	<b>182,57</b>	<b>358,13</b>	<b>540,70</b>	<b>1.445,77</b>	<b>0,016</b>	<b>0,057</b>
Las Palmas de Gran Canaria	53	2	0,01	7,73	7,74	1,06	0,000	0,004
S.C. de Tenerife	80	9	375,36	23,30	398,66	12,59	0,470	0,168
<b>CANARIAS</b>	<b>133</b>	<b>11</b>	<b>375,37</b>	<b>31,03</b>	<b>406,40</b>	<b>13,65</b>	<b>0,393</b>	<b>0,086</b>
<b>NAVARRA</b>	<b>441</b>	<b>159</b>	<b>173,12</b>	<b>894,06</b>	<b>1.067,18</b>	<b>61,62</b>	<b>0,050</b>	<b>0,213</b>
Badajoz	139	135	166,92	213,34	380,26		0,071	0,038
Cáceres	356	232	128,58	738,16	866,74		0,025	0,067
<b>EXTREMADURA (**)</b>	<b>495</b>	<b>367</b>	<b>295,50</b>	<b>951,50</b>	<b>1.247,00</b>		<b>0,040</b>	<b>0,055</b>
<b>ILLES BALEARS</b>	<b>117</b>	<b>4</b>	<b>5,66</b>	<b>18,96</b>	<b>24,62</b>	<b>19,71</b>	<b>0,005</b>	<b>0,022</b>
<b>MADRID</b>	<b>172</b>	<b>52</b>	<b>4,20</b>	<b>43,87</b>	<b>48,07</b>	<b>292,19</b>	<b>0,003</b>	<b>0,087</b>
Ávila	125	64	130,39	1.028,80	1.159,19	208,37	0,101	0,242
Burgos	85	34	64,91	297,35	362,26	109,50	0,018	0,051
León	189	475	438,51	4.678,02	5.116,53	534,75	0,282	0,595
Palencia	44	29	28,04	55,52	83,56	86,79	0,039	0,034
Salamanca	208	61	61,51	275,55	337,06	242,25	0,045	0,052
Segovia	47	16	627,09	366,18	993,27	30,17	0,366	0,303
Soria	79	13	19,78	81,07	100,85	28,37	0,006	0,016
Valladolid	40	19	22,90	5,31	28,21	38,62	0,022	0,019
Zamora	193	275	296,52	4.917,90	5.214,42	590,10	0,244	1,137
<b>CASTILLA Y LEÓN</b>	<b>1010</b>	<b>986</b>	<b>1.689,65</b>	<b>11.705,70</b>	<b>13.395,35</b>	<b>1.868,92</b>	<b>0,107</b>	<b>0,338</b>
<b>CEUTA</b>	<b>0</b>	<b>1</b>	<b>0,00</b>	<b>2,10</b>	<b>2,10</b>	<b>0,00</b>	<b>0,000</b>	<b>0,157</b>
<b>MELILLA</b>	<b>0</b>	<b>0</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>0,00</b>	<b>0,000</b>	<b>0,000</b>
<b>TOTAL</b>	<b>7.431</b>	<b>4.181</b>	<b>7.636,37</b>	<b>28.069,70</b>	<b>35.706,07</b>	<b>4.188,73</b>	<b>0,069</b>	<b>0,154</b>

(\*) Sin diferenciación entre superficie desarbolada herbácea y leñosa

(\*\*) Sin datos de superficie herbácea

### 2.1.3. France

#### *Fire danger in the 2008 fire season*

The rather humid second half of spring was followed by a dry summer with a marked lack of rain on the Mediterranean coast and in Corsica in July and August 2008. Consequently, by the end of August, the soils had become very dry in most of this region, particularly in Corsica, Provence and Roussillon. Nevertheless, temperatures were moderate and there were only a few windy days. Thus, the number of areas with extreme fire danger was smaller in the summer of 2008 (250) than the average for the previous ten years (600).

In south western France, where the fire danger tends to be greatest at the end of the winter and beginning of spring, this year's fire danger level was low.

#### *Fire occurrence and affected surfaces*

According to the French national database on forest fires, the burnt area in 2008 amounts to 6 000 ha, against an average of 25 600 ha for the last ten years. With favourable weather conditions over the whole territory, this is the lowest amount since records began in 1976.

80 % of the fire ignitions were extinguished before spreading (fires <1ha).

#### *Mediterranean zone:*

The area burnt by forest fires within the 15 Mediterranean departments of France in 2008 was 3 750 ha. This is lower than in 2007 (6 500 ha) and much lower than the average of 16 600 ha in the last decade.

During the summer, 1 920 ha were burnt (on average 14 000 ha are burnt in the 3 summer months). Similar to 1996 (when 3 200 ha were burnt, 1 800 ha of which in summer), these results are very encouraging; in particular since there were no serious casualties. Economic and environmental damages were also very limited.

There was only limited need for operational activities during the summer: 536 ignitions were recorded, the smallest number of summer fire ignitions since the beginning of the Prométhée statistical data records in 1973. About a third of the interventions (175) benefitted from national assistance. On average, 1 250 fires are recorded

during summer, 30 % of which receive national assistance.

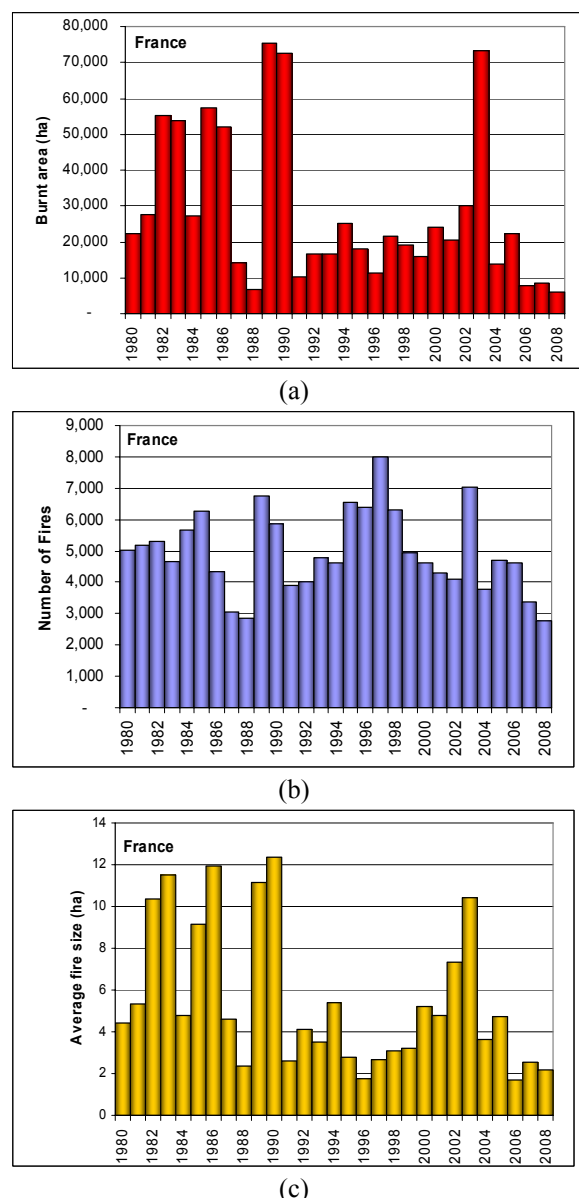


Figure 9. Burnt areas (a), number of fires (b) and average fire size (c) in France for the last 29 years.

There were only 2 large fires (> 100 ha) which is also a very small number compared to the average of 17 fires over 100 ha, including 3 fires of a size over 1 000 ha. The two large fires in 2008 developed in August:

- August 8<sup>th</sup>, VERIGNON (83), 415 ha, all within the military camp CANJUERS.
- August 28<sup>th</sup>, SAINT-ANDRÉ-DE-ROQUELONGUE (11), 815 ha (threatened infrastructure and buildings were protected by the fire brigade).

For both fires, considerable means were allocated by the State to support the local devices: ten water bomber airplanes (including



the two DASH), three columns of reinforcement of fire fighters (150 men), an intervention with retardant of military forces of civil protection.

Both fires were deemed to have been caused by negligence.

Languedoc-Roussillon, the most affected region:

In Languedoc-Roussillon, 1 900 ha were affected by fires in 2008, representing half of the affected area in the French Mediterranean zone, while on average this region accounts for only 15 %. If only summer fires are considered, Languedoc-Roussillon accounts for 60 % (1 200 ha) of the damaged area in the Mediterranean zone.

Non-Mediterranean zone

1 620 ha were affected by fires in the south-western departments (average in the last decade: 4 200 ha, 1 800 ha in 2007). Outside the southern and south-western zone, the affected area is estimated to be less than 700 ha, half of which burnt in April in the military zone of Morbihan.

#### *Fire fighting means*

In 2008, the 23 national water bomber airplanes participated in the extinction of 160 fires (115 in summer) and approximately 60 aerial fire detection missions. These interventions amounted to 1 760 flight hours, 40 % of which were for aerial fire detection. As a yearly average, water bomber airplanes consume 4 700 flight hours. The use of aerial means was thus moderate in 2008.

The military sections of the civil protection positioned in Corsica mainly assisted the ground missions. They performed 610 surveillance missions during which they intervened in about 50 fire ignitions. On the mainland, they intervened in 10 fires and provided support to about 20 ground missions.

The reinforcement of fire brigades within the Southern zone represented a volume of 1400 man-days, the average for the last 10 years being 15 000 man-days.

Taking into account the favourable weather conditions, the result of the 2008 fire season is very positive. Several points are worth mentioning:

- the reinforcement of the intervention capacities of the Ministry of the Interior (purchase of a twelfth Canadair CL415 in 2007, addition of 2 heavy water bomber DASH airplanes to the air fleet, setting up of detached intervention groups (with retardants) within the military sections of the civil protection) and the applied systematic anticipation approach in order to intervene on any fire ignition without delay (over 85% of the fires affected less than 1 ha)
- the constant availability of national means to assist the local fire brigades (means have been mobilized for 175 fires and allowed to provide support to all requests). National assistance was also provided for active prevention measures (aerial fire detection missions and ground surveillance mainly in Corsica).
- the particularly positive results in Corsica where less than 380 ha were affected by 400 fires (as opposed to the average of the last decade of 6 200 ha, 500 fires). This represents the best results obtained on the island. Once more, the clear reduction of fire ignitions is owed to the joint effort to cover the whole area by fire brigades, foresters, and also police forces and gendarmerie. Given the high number of fire ignitions that often occur simultaneously, it is absolutely crucial that this effort continues in the future.
- The awareness raising campaigns, together with the cooperative actions of police, gendarmerie and the Court with the fire brigades and foresters in seeking fire causes, thus resulting in a limited number of fire ignitions of less than 550 (less than half the average in the last decade (1 250) and the smallest number ever known).

These positive outcomes are further owed to the prevention efforts undertaken under the auspices of the Ministry of Agriculture and Fisheries for the surveillance and land use management, implemented at the departmental level, such as:

- in the Mediterranean region, actions were coordinated by the Prefecture; patrols performed look-out missions and initial attacks during the summer thanks to civil servants, mainly from the National Forest Office in collaboration with the local communities

- the maintenance and increase of forest fire equipment (forest roads, water points, observation towers, strategic firebreaks)
- the Prefecture role to reduce the lack of clearance of brushwood in the surroundings of private housing and infrastructures. The checking of complying with this obligation, under the responsibility of owners of infrastructures, was reinforced through more field-checks and awareness campaigns under the responsibility of the local administration.

#### *Loss of human lives*

There were neither any deaths nor serious injuries in 2008.

#### *Operations of mutual assistance*

As suppression activities in the Mediterranean basin were much more limited in summer 2008 compared with the previous year, operations of mutual assistance from France were restricted to

- Greece, end of July: Two Canadair intervened during 3 days, devoting about 60 flight hours, on a fire which burnt an area of 12 000 ha on the Island of Rhodes
- Bulgaria, end of September: Two Canadair intervened during 3 days, devoting about 50 flight hours, on a fire which spread in a national park affecting an area of 150 ha

*(Source: Ministère de l'Intérieur - Direction de la Défense et de la Sécurité Civiles; Ministère de l'Agriculture et de la Pêche - Bureau Forêt, Territoires et Chasse, France)*

### 2.1.4. Italy

#### *Forest fires in the 2008 fire season*

Forest fires in Italy in 2008 have been much less intense compared to the previous year, which in turn was one of the most difficult years ever recorded, with several thousands of hectares burned. In 2007 wildfires not only devastated the forests and caused extremely severe damage, but also caused the loss of 23 human lives.

The significant reduction of the phenomenon in 2008 is primarily due to climatic conditions (relatively high spring rain, absence of heat waves, relatively low winds) which, with some exceptions, did not favour the propagation of fire ignitions.

In 2008, there were 6 486 fires recorded, burning a total area of 66 329 ha, of which 30 273 were wooded and 36 329 non wooded.

The yearly trends in terms of numbers of fires and burnt areas during the last 29 years in Italy are shown in Figure 10.

It can be noticed that every 3-4 years we had a critical year with respect to the burned areas which are significantly higher than normal. This is due to the fact that with a similar periodicity we have favourable conditions for forest fires namely:

- Drought conditions
- Fuel accumulation in areas that are periodically burned

A decrease in the level of alert of local fire fighting organizations, that have not been so busy in active fire fighting during the previous few years.

In Italy, forest fires occur in all regions. Normally during winter they are mostly in the Alpine regions (especially the northwestern regions), while in summer they are mostly in the Mediterranean regions (southern regions and islands). In Liguria, fires occur both in summer and in winter. During the last years, Mediterranean regions such as Lazio and Campania also had winter fires.

Table 6 shows the distribution of fires in 2008 by region. An analysis of the data shows that 2008 was not a critical year. Indeed, the comparison with historical data on an annual basis shows that only exceptionally have there

been fewer fires. 2008 is also one of the years with the lowest area burned.

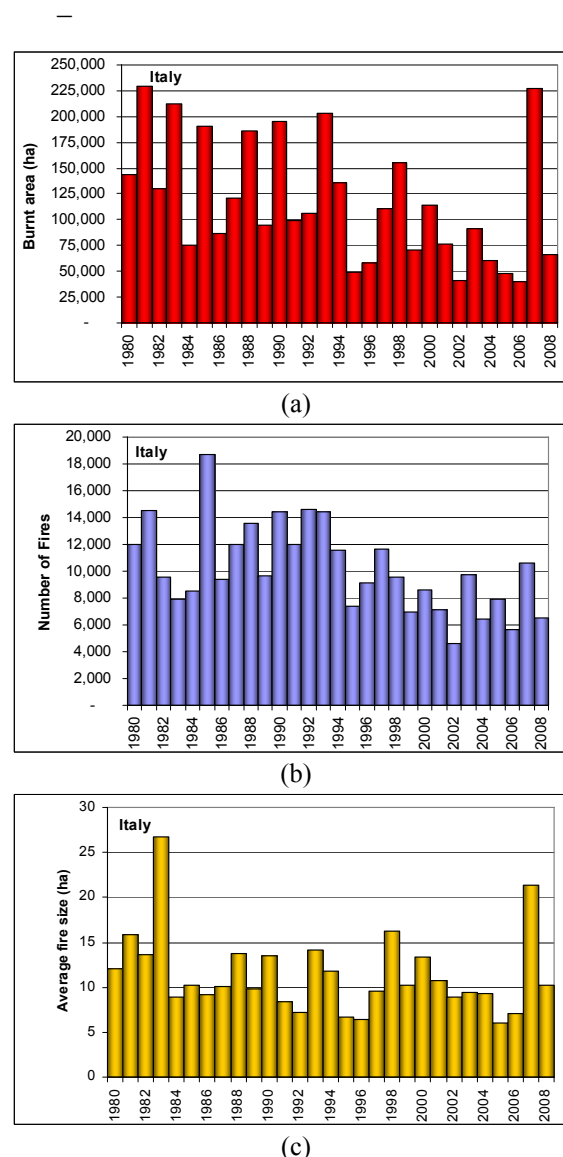


Figure 10. Burnt areas (a), number of fires (b) and average fire size (c) in Italy for the last 29 years.

In 2008 the number of fires was about 49% less than in 2007 and the wooded burned area was about 86% less. Forest fires were especially concentrated in southern regions. The worst affected region was Calabria both for number of fires (1279), total burned area (18 009 hectares) and wooded burned area (10 236 hectares). Calabria was also the region that suffered major damages in 2007 due to a number of factors, including climatic conditions, vegetation and social, but also due to the persistence of certain organizational drawbacks that still have to be improved.

Table 6. Forest fires by region in Italy 2008.

Region	#Fires	Burned area			
		Wooded	Non wooded	Total	Average
VALLE D'AOSTA	11	6	8	14	1.3
PIEMONTE	157	698	206	905	5.8
LOMBARDIA	153	597	545	1 141	7.5
TRENTINO A. A.	25	1	2	3	0.1
VENETO	48	15	13	27	0.6
FRIULI V. G.	66	13	54	68	1.0
LIGURIA	291	411	413	824	2.8
EMILIA ROMAGNA	128	85	71	157	1.2
TOSCANA	456	452	537	989	2.2
UMBRIA	116	137	204	341	2.9
MARCHE	36	28	41	69	1.9
LAZIO	347	1 701	1 048	2 750	7.9
ABRUZZO	95	291	325	616	6.5
MOLISE	166	319	494	813	4.9
CAMPANIA	799	2 936	1 020	3 956	5.0
PUGLIA	486	4 212	4 278	8 489	17.5
BASILICATA	307	2 327	2 930	5 257	17.1
CALABRIA	1 279	10 236	7 773	18 009	14.1
SICILIA	797	4 041	13 733	17 774	22.3
SARDEGNA	723	1 767	2 360	4.127	5.7
<b>TOTALE</b>	<b>6 486</b>	<b>30 273</b>	<b>36 055</b>	<b>66 329</b>	<b>10.2</b>

#### Major fires in 2008

The largest fire occurred in Apulia (municipality of Cagnano Varano, province of Foggia) in the area of Gargano National Park. The fire started on August 15 and quickly reached large proportions favoured by high temperatures (about 40°) and the strong wind. The fire burned more than 700 hectares, of which 247 were wooded, and 350 ha of pasture. The greatest damages occurred in the oak coppice, with 145 ha burned. The fire was caused by a fire lit only for the purpose of opening or renewal of grazing.

Also in the province of Foggia, in the town of Serracapriola, a fire of huge proportions started on July 7, affecting 555 hectares, 30 of which were woodland.

In Agro di Altamura (province of Bari) a large fire developed on August 14, affecting 553 hectares, of which 428 were woodland.

On September 7 the municipality of Pisticci in the province of Matera was affected by a large fire, burning 517 hectares, including 313 of woodland.

In Caulonia, province of Reggio Calabria on August 5 there was a huge fire that burned 638 hectares.

#### Fire fighting means and information campaigns

Despite the reduction in number of fires and forest fires, Italy is among the European countries where the phenomenon of forest fires is particularly serious.

In many of the Italian regions, the majority of fires are detected and extinguished when the fires are of minimal size, so that only few fires escape control. However, these few fires are those determining the greater part of the burned area and often also affect urban areas and infrastructures, causing serious damage and particular concern.

In synthesis in Italy:

- the number of fires tends to decrease although modestly;
- the burned area tends to decrease and consequently the average fire size decreases;
- there are significant variations from year to year and among regions;

The phenomenon of forest fires is not generalized throughout the country, as about 50 out of the 110 provinces are most affected and therefore these should be the focus of attention. The fire fighting system, which in some regions

reached the level of excellence, is fragile overall.

In Italy the Regions have the primary responsibility in the field of forest fires and, through international conventions and program agreements, make use of the State Forest Service (CFS) in prevention, preparedness, coordination, fighting, in the regional operating rooms and in the survey of burned areas, and the National Service of Fire Brigades for active fire-fighting and in the regional operating rooms.

For environmental emergencies (such as forest fires) there is the public phone number **1515**, active 24 hours a day, which coordinates the activities in the territory of specific emergency patrols, in addition to the number 115 of Fire Brigades.

Territorial monitoring for fire prevention, investigation and law enforcements are carried out independently by highly specialized staff to identify causes of ignition, and are of paramount importance. Monitoring and analysis of forest fires are supported by computerized procedures that enable the updating of the "Territorial Dossier" formed for the management of all the territorial information, used by both police and civil protection authorities.

Over the last year the Administration has given special attention to the professional training of staff.

In the EU, officers of CFS are incorporated into the system of reinforced cooperation Fire 5 (*Force d'Intervention Rapide Européenne 5* - Portugal, Spain, France, Italy and Greece): three at level 1 (*general*), one at level 2 (*advanced*), one at level 3 (*self-training*) and one at level 4 (*Experts exchange*). Three officers are also qualified for interventions in international emergency and humanitarian relief.

An officer of CFS has developed a specific glossary of technical terms in 6 languages (*Forest Fire Fighting Terms Handbook*) proposed to be adopted by the European Union for participants in international forest fire fighting missions.

In April 2008 an international exercise on forest fire fighting organised by the Department of Civil Protection took place in Sardinia, and was named FIRE 5 - S.Ar.Di.Ni.A. 2008 (*Force d'Intervention Rapide Européenne 5 - Sardinia Arson Direct Nixing Action*), under the Community Civil Protection Mechanism. It was attended by national and international observers,

the regional mobile Columns, the State Forest Service, the National Service of Fire Brigades, the Forest and Environmental Security Service of the Region of Sardinia, a team of 9 players for investigation and evidence gathering in forest fire locations, supplemented by dog units of the core forest fire investigating body of CFS.

This unit is the first in the world with a dog trained to detect combustion accelerators, possibly found in incendiary bombs in the forest after the fire.

On 13-15 May 2008, after a joint initiative of CFS and FAO and with the support of the *Silva Mediterranea* Working Group on Forest Fires and of the Joint Research Centre of the European Commission, the *Workshop on Forest Fires in the mediterranean Region: Prevention and Regional Cooperation* was organised in Sabaudia, Italy, providing an important opportunity for international comparison and study on prevention of forest fires in the Mediterranean region. The outcome of the meeting was a report detailing recommendations and conclusions (see full report at <http://www.fao.org/docrep/010/k2891e/k2891e00.htm>).

To improve the coordination of CFS and the National Service of Fire Brigades and to define the specific areas of responsibility, a specific Framework Agreement for the active fighting of forest fires was signed on 16 April 2008 by the Minister of Interior and the Minister of Agriculture Food and Forestry.

The Agreement provides that in case of a forest fire, even in presence of sparsely populated areas, the function of Fire Boss is exercised by the CFS. The Fire Brigades manage the defence of settlements of persons, in consultation with the Forest Fire Boss; in cases of fire at the wildland urban interface the priority goes to safeguarding human lives and settlements; therefore the Fire Brigade Service is appointed Fire Boss.

The CFS carries out the verification and supervision of forest fire prevention plans of national and regional parks and protected natural areas.

#### *Fire causes and investigation activities*

Overall, the activities against forest fire crimes in 2008 made by the territorial offices of CFS, resulted in the reporting of 463 people to the

Court of Justice, including 13 taken under arrest or under custody measures for fire arson.

Investigations carried out by the CFS confirmed the three motivational levels at the basis of the phenomenon:

- a) negligence, that sometimes appears as irresponsibility, caused above all by the destruction of plant residue or cleaning land and wasteland;
- b) widespread illegality, linked to poaching wild boar; events caused by the people responsible and volunteers for extinguishing; reprisals;
- c) rural criminality, in situations where shepherds are linked to criminal contexts; intention to depreciate lands and woodland; intimidations; interests in subsequent construction and reforestation.

Regarding deliberate fire causes, the trend of previous years is confirmed. Fires due to negligence were caused by either the removal of crop residues (209 - 45%), the burning of stubble (61 - 13%) the cleaning of fallow (34 - 7%), or the negligent use of electrical or mechanical motor equipment in wooded or rural areas, which developed sparks causing fires (25-5%).

Overall, during the period 2000 - 2007 the perpetrators who have been identified and reported to the Court of Justice correspond to 7.4% of the total number of deliberate fires. In 2008 this percentage increased to 10.2%, improving the overall result.

This percentage may be considered partially satisfactory, given the high number of crimes, the framework of widespread illegality that characterizes the phenomenon, the vastness of the territories in which they committed the offenses and the multiplicity of motives and causes behind forest fires. The investigations conducted in 2008 showed that 16% of the 74 people reported to the Court of Justice had a criminal record. The arrests were all made as a result of a complex investigative work in areas repeatedly affected by forest fires.

Several investigations were carried out in the regions of Tuscany, Campania, Calabria, Lazio, where the ignition points were identified, in order to collect evidence of traces of weapons or

primers or combustion accelerators, in the search for the forest fire origin and cause.

In 2008, following a Directive of the Minister of Agriculture, Food and Forestry, funding has been provided to the territorial offices of CFS of the nine regions and twenty-two provinces most affected by the phenomenon to support the activities against the crimes of arson.

#### *Loss of human lives*

In Table 7 the number of people that suffered injuries or lost their lives in forest fires during the last 29 years in Italy is given. In 2008 there were reported 3 casualties and 10 injuries.

Table 7. Injured people and victims of forest fires in Italy (1980-2008)

	<i>Injured</i>	<i>Victims</i>
1980	31	4
1981	40	9
1982	27	6
1983	39	15
1984	19	6
1985	93	16
1986	38	9
1987	104	3
1988	80	6
1989	80	12
1990	119	10
1991	55	6
1992	50	6
1993	76	12
1994	37	1
1995	12	1
1996	14	2
1997	97	5
1998	81	6
1999	34	6
2000	70	2
2001	23	3
2002	37	5
2003	75	7
2004	35	2
2005	43	3
2006	17	1
2007	28	23
2008	10	3

(Source: Ministero delle Politiche Agricole Alimentari e Forestali, Corpo Forestale dello Stato, Italy).

### 2.1.5. Greece

#### *Fire danger in the 2008 season*

In summer 2008 there were no extreme weather conditions. July was the more difficult month and during this month there were 2 large fires in the islands: the largest fire occurred on Rhodes island (Agios Isidoros) on the 22<sup>nd</sup> of July and the burnt area exceeded 10 000 ha. On the 12<sup>th</sup> July, a smaller fire occurred in Skyros island (Mavri Kandilia), which burnt 2 500 ha. Both fires occurred in areas with pine forest.

#### *Fire occurrence and affected surfaces*

During 2008, 1 481 forest fires occurred, the majority with a burned area lower than 1 ha. The number of forest fires remained below the annual mean in comparison to the results of previous years. The burnt area was also low, 29 152 ha, of which 82% occurred in wooded areas.

The number of forest fires and the burnt area of 2008 in Greece, per region, are shown in Table 8. The provisional results of the fire campaign of 2008 in Greece, according to data available from the first estimation of the Fire Brigade and without verification up to now from the Forest Service, are shown in Table 9.

Table 8. Number of fires and burned area in 2008 by regional forest administration

<i>Forest administration</i>	<i>Total number of fires</i>	<i># fires &lt;1 ha</i>	<i># fires 1-5 ha</i>	<i># fires 5-100 ha</i>	<i># fires 100-500 ha</i>	<i># fires &gt;500 ha</i>	<i>Total Burned area (ha)</i>	<i>Wooded Burned area (ha)</i>	<i>Non wooded Burned area (ha)</i>
<i>REG. EAST MAC. THR.</i>	107	59	27	18	3	0	892	810.7	81.3
<i>REG. CENT. MACEDONIA</i>	63	34	17	9	2	1	1238.3	1213.7	24.6
<i>REG. W. MACEDONIA</i>	86	57	17	12	0	0	298.9	174	125
<i>REG. IPEIROU</i>	233	174	36	22	1	0	579.6	530.4	49.2
<i>REG. THESSALIAS</i>	97	58	17	20	2	0	968.5	511.2	457.2
<i>REG. IONIAN ISLANDS</i>	203	150	35	16	1	1	2797.2	2768.1	29.1
<i>REG. W. GREECE</i>	54	52	2	0	0	0	14.9	14.9	0
<i>REG. ST. GREECE</i>	227	172	21	31	2	1	3049.2	1699.3	1350
<i>REG. ATTIKIS</i>	25	15	4	5	1	0	404.8	403.6	1.2
<i>REG. PELOPONISOU</i>	287	214	47	23	2	1	3384.5	3384.5	0
<i>REG. N. AIGAIU</i>	19	17	0	1	0	1	1860.2	119.3	1740.8
<i>REG. S. AIGAIU</i>	19	17	1	0	0	1	13007.6	11804.5	1203.1
<i>REG. KRITIS</i>	61	38	12	9	2	0	656.3	427.5	228.8
<b><i>TOTAL</i></b>	<b>1 481</b>	<b>1 057</b>	<b>236</b>	<b>166</b>	<b>16</b>	<b>6</b>	<b>29 152</b>	<b>23 861.7</b>	<b>52 90.3</b>

Table 9. Provisional forest fire data (1/1/2008 - 31/12/2008)

<i>Forest fires in Greece (1/1/2008 – 31/12/2008)</i>		<i>GREECE (1)</i>	<i>GREECE (2)</i>	<i>GREECE (1+2)</i>
<b><i>NUMBER OF FIRES</i></b>	<i>&lt;1 ha</i>	1 057	4 905	5 962
	<i>1 - 5 ha</i>	236	450	686
	<i>5 - 100 ha</i>	166	144	310
	<i>100 - 500 ha</i>	16	9	25
	<i>&gt;500 ha</i>	6	0	6
	<b><i>TOTAL</i></b>	<b>1 481</b>	<b>5 508</b>	<b>6 989</b>
<b><i>BURNT AREAS (ha)</i></b>	<i>FORESTS</i>	23 861.7	0	23 861.7
	<i>NON FORESTS</i>	5 290.3	7 736.1	13 026.4
	<b><i>TOTAL</i></b>	<b>29 152.0</b>	<b>7 736.1</b>	<b>36 888.1</b>

(1) Forest fires data from Forest Service; (2) Additional fire data as reported by the Fire Brigade  
(1+2) sum of (1) and (2)

### Fire fighting means

The personnel of the Fire Brigade involved in suppression efforts comprised 14 736 persons. Of these, 9 236 are permanent personnel of the Fire Brigade, which deals also with structural fires, while 5 500 personnel are seasonally hired just for forest fire suppression activities. Fire Brigade of Greece owns about 1 536 engines, which are involved in both structural and forest fire suppression efforts. Some other small engines owned by Municipalities of high risk areas were involved occasionally in some incidents. The aerial means used during the campaign are indicated in Table 10.

During the operations 2 fire engines were destroyed (burnt) and another 3 were seriously damaged.

In the 2009 season, the personnel of the Fire Brigade involved in suppression efforts will be increased in 9 930 persons and the number of fire engines will be 1 655. It is also planned to hire 4 more helicopters than were used in the 2008 season, while no change is expected in the numbers of aircrafts involved.

Table 10. Aerial means participating in the 2008 campaign

STATE OWNED MEANS			
AIRCRAFTS	LARGE	CL-215	13
		CL-415	8
		C-130 + MAFFS	-
	SMALL	PEZETEL	18
		GRUMMAN	3
HELICOPTERS		H/P PK 117	3
		SUPER PUMA	2
		TOTAL	47
HIRED MEANS			
HELICOPTERS		H/P MI-26	4
		H/P SIKORSKY 64	4
		H/P MI-8-MTV	3
		H/P KA-32	1
		TOTAL	12

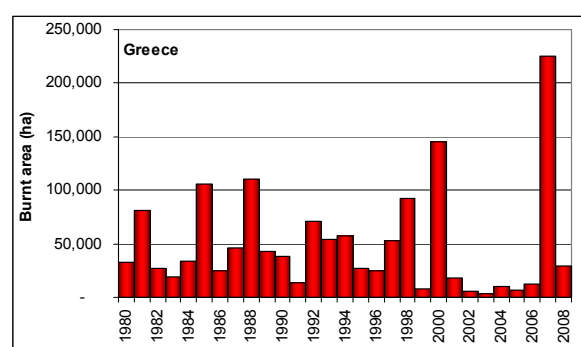
### Operations of mutual assistance

During the fire campaign, in response to the demands of mutual assistance from the USA and Cyprus, a group of firefighters went to the

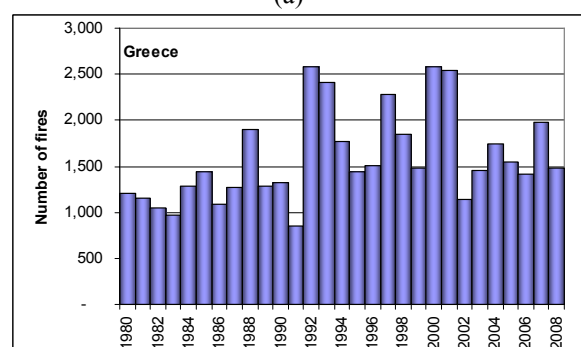
USA between 15<sup>th</sup> July and 9<sup>th</sup> August, and 2 aircrafts CL 415 went to assist Cyprus to control fires on the 18<sup>th</sup> of June, respectively. Greece received assistance by demand during the fire of Rhodes 25 – 28 July, from Italy came two CL 415, from France another two CL 415, and from Cyprus one Helicopter.

### Injuries and loss of human lives

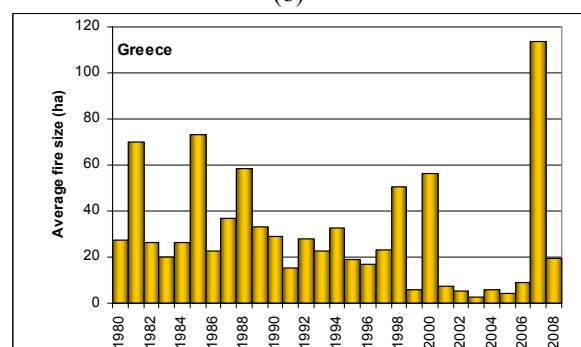
During the fire season, a citizen lost his life (in a non forest fire – Nafpaktos, June 18). There were 19 fire fighters injured and 14 citizens suffered burns.



(a)



(b)



(c)

Figure 11. Burnt areas (a), number of fires (b) and average fire size (c) in Greece for the last 29 years



Table 11. Wildfires not classified as forest fires (fires that do not burn in areas classified as forestland) in 2008

<i>Forest administration</i>	<i>Total number of fires</i>	<i># fires &lt;1 ha</i>	<i># fires 1-5 ha</i>	<i># fires 5-100 ha</i>	<i># fires 100-500 ha</i>	<i># fires &gt;500 ha</i>	<i>Burned area (ha)</i>
<i>REG. EAST MAC. THR.</i>	846	656	134	54	2	0	1 785.8
<i>REG. CENT. MACEDONIA</i>	1 218	1 126	77	14	1	0	863.1
<i>REG. W. MACEDONIA</i>	80	63	10	7	0	0	833.3
<i>REG. IPEIROU</i>	360	332	20	8	0	0	169.4
<i>REG. THESSALIAS</i>	265	211	41	10	3	0	1 045.5
<i>REG. IONIAN ISLANDS</i>	285	278	6	1	0	0	0
<i>REG. W. GREECE</i>	138	137	1	0	0	0	18.3
<i>REG. ST. GREECE</i>	290	252	35	3	0	0	164.8
<i>REG. ATTIKIS</i>	0	0	0	0	0	0	0
<i>REG. PELOPONISOU</i>	1 085	1 043	36	5	1	0	602.3
<i>REG. N. AIGAIUO</i>	45	45	0	0	0	0	8
<i>REG. S. AIGAIUO</i>	1 375	1 340	71	8	1	0	775.1
<i>REG. KRITIS</i>	686	629	40	15	2	0	1 470.5
<b><i>TOTAL</i></b>	<b>5 508</b>	<b>4 905</b>	<b>450</b>	<b>144</b>	<b>9</b>	<b>0</b>	<b>7 736.1</b>

(Source: Ministry of Rural Development and Foods .General Directorate for Development and Protection of Forests and Natural Environment, Greece)

## OTHER MEMBER STATES

The situation in the Other Member States of the EU is analysed separately because the figures in terms of numbers of fires and areas burnt differ significantly from those of the Southern States as presented in the previous chapter.

### 2.1.6. Bulgaria

#### *Fire danger in the 2008 fire season*

The forest land in Bulgaria is 4 089 762 hectares (ha) and occupies 37% of the territory of the country. Of the territory classified as forest land, 3 691 868 ha (89%) are wooded areas.

After the disastrous year of 2007 (the second worst year in the history of the Bulgarian forests, with 1 479 forest fires and 43 000 ha burned), the 2008 fire season was typical for forest fires in Bulgaria with a short spring fire period and a dry summer fire period during the second part of July and August.

#### *Fire occurrence and affected surfaces*

In 2008, a total number of 582 forest fires took place in Bulgaria affecting an area of 5 289 ha of wooded and non-wooded forest ground. The most affected regions were Lovech – 1 490 ha burnt, Haskovo – 730 ha, Burgas – 540 ha and Sofia 440 ha.

The main causes of forest fires during 2008 were the following:

- Carelessness – 79%
- Deliberate or Arson – 4%
- Natural – 1%
- Unknown – 16%

The main known reason is burning of stubble and vegetable residuals by farmers.

The immediate loss for Bulgarian forests in 2008 are calculated to be 700 000 Euro, without considering the budget for the restoration of the burned areas. The average loss for the last 13 years however is estimated to be 6 500 000 Euro per year.

Figure 12 shows trends in the number of fires and burnt areas in Bulgaria from 1991 to 2008. Detailed figures on burned area a fire causes during the last 10 years are presented in Table 12.

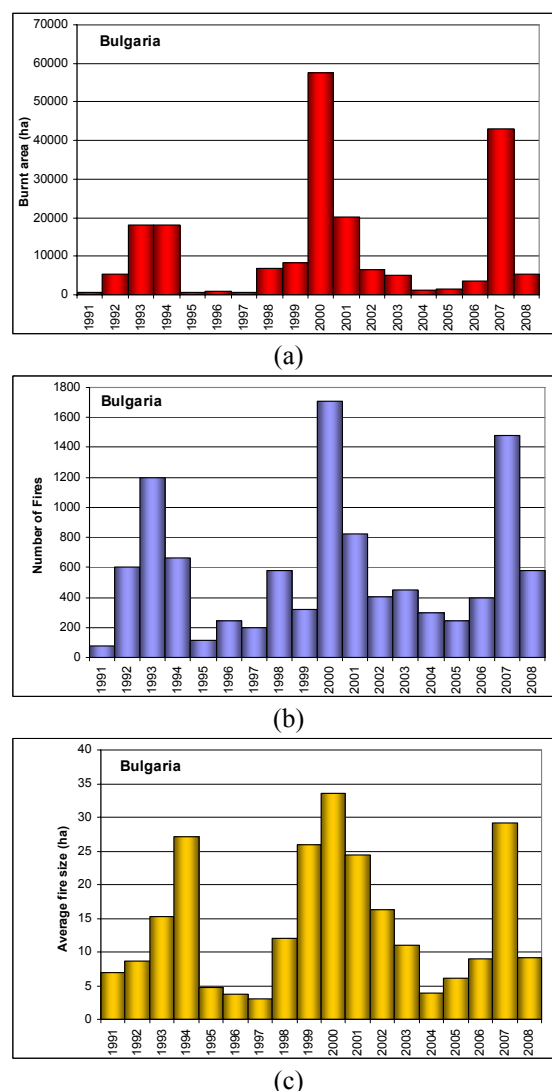


Figure 12. Burnt areas (a), number of fires (b) and average fire size (c) in Bulgaria from 1991 to 2008.

#### *Operations of mutual assistance*

At the end of July Bulgaria made a request for assistance to EU/MIC as EU Member State, because of the forest fire in the “Rila Mountain” National Park. Two Canadair 415 amphibious aircrafts were sent to Bulgaria from France.

(Source: State Forestry Agency, Sector Forest Fire Management, Bulgaria)

Table 12. Forest fire statistics for Bulgaria for the period 1999-2008

Year	Total number of fires	Burnt area [ha]		Fires causes (number of fires)		
		Total	Forest lands	by human activities	Naturally	unknown
1999	320	8291	4198	84	9	227
2000	1710	57406	37431	385	18	1307
2001	825	20152	18463	187	19	619
2002	402	6513	5910	150	7	245
2003	452	5000	4284	281	9	162
2004	294	1137	881	172	5	117
2005	241	1456	1456	125	7	109
2006	393	3540	3540	190	9	194
2007	1479	42999	42999	1163	18	298
2008	582	5289	5289	482	8	92
Mean	<b>670</b>	<b>15178</b>	<b>12445</b>	<b>288</b>	<b>11</b>	<b>370</b>

## 2.1.7. Cyprus

### *Fire danger in the 2008 fire season*

Cyprus suffered an intensive drought period throughout 2008, following the trend of the previous year.

### *Fire occurrence and affected surfaces*

During 2008, a total number of 114 forest fires broke out in Cyprus, affecting an area of 2 392 ha. The trends regarding both the number of fires and burnt areas over the last 9 years (2000-2008) are shown in Figure 13. The total number of forest fires in Cyprus during this period was 2 057 fires and the total burnt area was 28 500 ha.

During the 2008 fire season a total number of 6 forest fires, with burnt area equal to or greater than 50 ha, were recorded.

### *Injuries and loss of human lives*

In Cyprus, 1 civilian died and 4 were injured during a fire on the 22nd of June, and 10 fire fighters were injured during the big fire in the village “Ora”, on the 18<sup>th</sup> of June.

### *Fire fighting means and information campaigns*

The average response time for the last decade is 12 minutes. For 93% of the total number of forest fires, the burnt area does not exceed 5 hectares in size.

For the detection and report of forest fires, a network of 27 permanent and temporary lookout stations have been installed. A number of fires were also detected by forest officers on patrol as well as by citizens living nearby or passing through forested areas.

Table 13. Number of forest fires and burnt areas in Cyprus from 2004 to 2008

Year	Number of fires	Burned area (ha)		
		Total	Forest and other wooded land	Agriculture and other artificial land
2004	221	1218	667	551
2005	185	1838	962	876
2006	172	1160	888	272
2007	111	4483	3704	779
2008	114	2392	1997	395

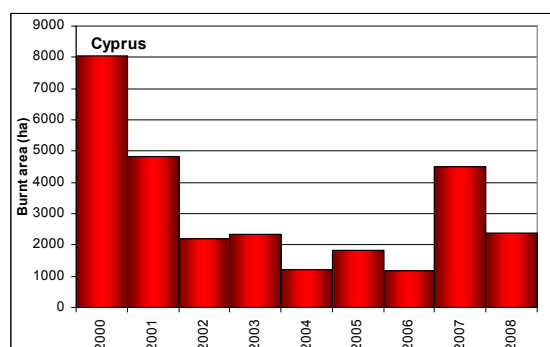
A large number of fire engines, crawler tractors and agricultural tractors were used in fire fighting operations during the summer of 2008. Additionally, a fire fighting aeroplane of the Department of Forests and three fire-fighting helicopters that are leased by the Ministry of Interior, were used. Moreover, Army and Police helicopters were also involved in fire fighting operations in some cases.

During 2008 a campaign aiming to inform the public about forest fire prevention practices, changing attitudes and behaviour and creating awareness on fire prevention, was undertaken during the whole year and especially during the summer period. Through this campaign, students and other NGOs were informed about the importance of the forests and ways to protect them from fires. Moreover, training programmes on fire prevention and suppression methods were organised and materialized for the members of the fire fighting ground forces, as well as for members of other governmental services and volunteers.

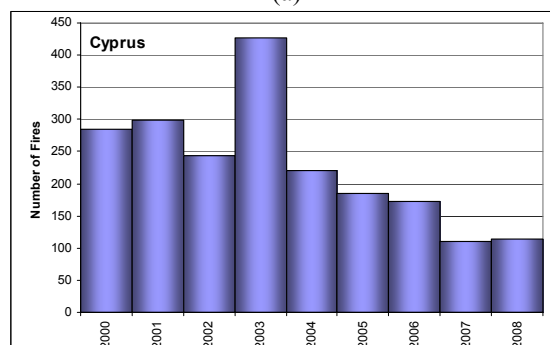
#### *Operations of mutual assistance*

The most destructive forest fire broke out on the 18th of June 2008 at “Ora” village, in Larnaka district. For the suppression of this fire (burnt area 1362 hectares) assistance was requested from Greece, and two Canadair 415 amphibious aircrafts were sent to Cyprus.

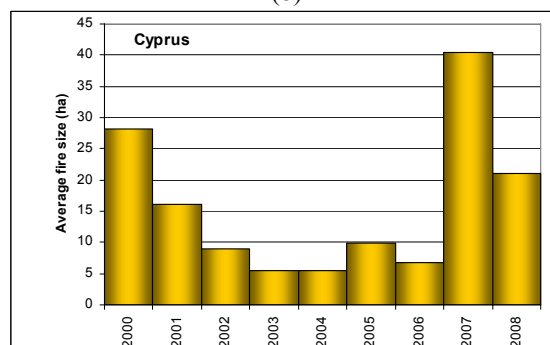
*(Source: Ministry of Agriculture, Natural Resources and Environment, Department of Forests, Cyprus).*



(a)



(b)



(c)

Figure 13. Burnt areas (a), number of fires (b) and average fire size (c) in Cyprus from 2000 to 2008.

### 2.1.8. Estonia

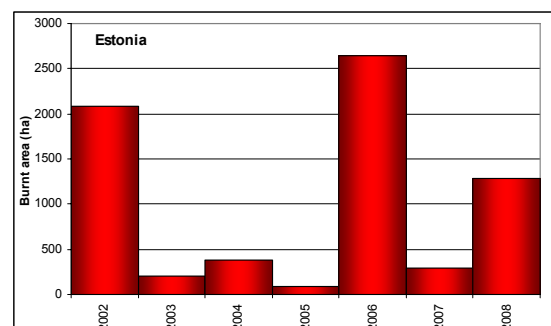
In 2008 a total number of 1 991 forest fires and wildfires were recorded; 71 of these were classified as forest fires (Table 14). Forest fires and wildfires caused the death of 1 person and destroyed 4 buildings. In 2007, 2 055 forest fires and wildfires were recorded, 64 of which were classified as forest fires. Forest fires and wildfires caused the death of 1 person and destroyed 40 buildings.

Table 14. Forest fires in Estonia 1999-2008

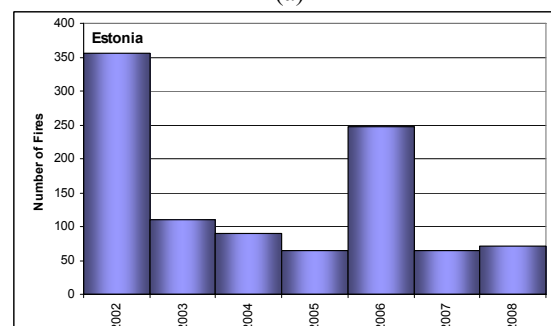
Year	Number	Area (ha)	Average area (ha)
1999	130	1103.4	8.5
2000	158	683.9	4.3
2001	91	61.8	0.7
2002	356	2081.7	5.9
2003	111	206.6	1.9
2004	89	378.9	4.3
2005	65	86.5	1.3
2006	250	3095.6	12.4
2007	64	292.4	4.6
2008	71	1279.8	18.0

Forest fires in 2008 were recorded in 13 counties. The highest number of fires (22) was in the county of Harju. The first fire in 2008 was recorded in April, the last one in July. The largest fire of 2008 occurred in May in Harju county Vihterpalu. In the course of 6 days, 804 ha of bog forest were burnt.

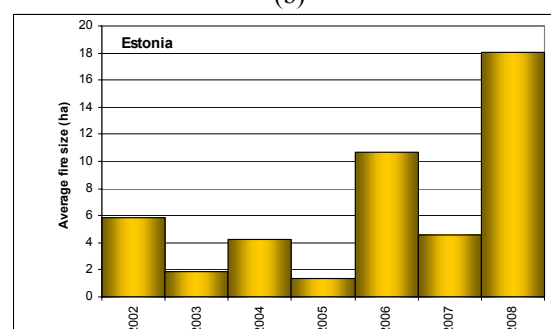
The Rescue Board is responsible for fighting forest fires, including wildfires, and for managing rescue works. Since forest fires and wildfires are extremely specific, the Rescue Board cooperates in its operations with the State Forest Management Centre, the Environmental Inspectorate, local governments, volunteer organisations and other institutions. Regional cooperation training sessions in fighting forest fires and wildfires are held for institutions engaged in the process.



(a)



(b)



(c)

Figure 14. Burnt areas (a), number of fires (b) and average fire size (c) in Estonia from 2002 to 2008.

### Fire causes

In 2008, 99% of forest fires were originated by human influence, either directly or indirectly, while 1% were started by lightning. 40% of the human fires were caused by careless smoking and making fire.

(Source: Centre of Forest Protection and Silviculture, Estonia).

### 2.1.9. Finland

#### *Fire danger in the 2008 fire season*

In Finland the fire season 2008 was an average one. The number of wildfires increased about 10% compared with 2007.

#### *Fire occurrence and affected surfaces*

The total number of wildfires in Finland was 3 161, of which 1 415 were reported as forest fires. The total burned area was 1 175 ha, 824 ha of forest land. The average burned forest area per fire was 0.6 ha, a slight increase on previous years; it was less than half a hectare from 1998 to 2005 and in 2007. The statistics from 1996 to 2008 on the number of fires and burned area are presented in Figure 16.

#### *Fire damages and injuries*

The ground fire prevention system and the response system are working very effectively in Finland. Ground fires did not cause any injuries or deaths to people or damage to any buildings. The only damage was the burned area; i.e. only minor economic loss.

#### *Fire causes*

The most common reason for wildfire is related to human action; i.e., about 60% of the fires were caused by humans, although in most cases the fires are not caused deliberately. In Finland, only a very small number of fires are caused by arson. Weather conditions, such as thunderstorms, caused 5% of the fires. However, the cause of the fire could not be found in 20% of cases.

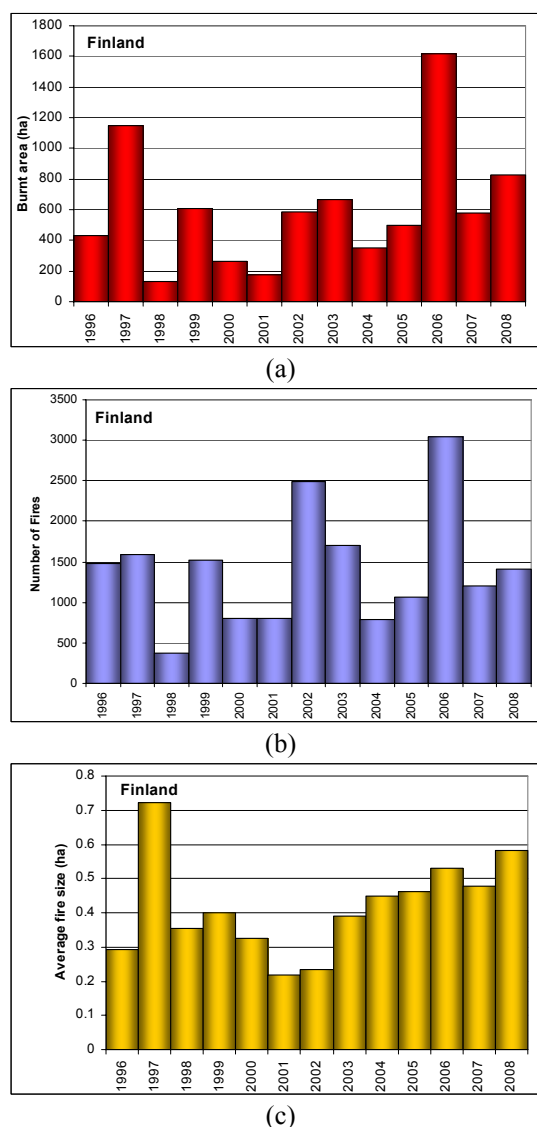


Figure 15. Burnt areas (a), number of fires (b) and average fire size (c) in Finland from 1996 to 2008.

Table 15 shows the number of wildland fires per year, including forest fires.

(Source: Ministry of Interior, Department for Rescue Services, Finland)

Table 15. Number of forest and wildland fires in Finland (1996-2008)

Year	Forest fires	Non forest fires	Total wildland fires
1996	1475	1983	3458
1997	1585	2327	3912
1998	370	1007	1377
1999	1528	2080	3608
2000	806	1302	2108
2001	796	1114	1910
2002	2489	2637	5126
2003	1707	2134	3841
2004	783	1415	2198
2005	1069	1562	2631
2006	3046	3244	6290
2007	1204	809	2013
2008	1415	1746	3161

### 2.1.10. Germany

#### *Fire occurrence and affected surfaces*

A total of 818 forest fires were reported in Germany in 2008, corresponding to a burnt area of 538.5 ha (220.3 ha in deciduous forests and 318.2 ha in coniferous forests).

By far the most affected province (Land) was Brandenburg with 340 forest fires burning an area of 365 ha. The second most affected Land in terms of number of fires was Niedersachsen with 129 ignitions; however only 17.6 ha forest was burnt by these fires. In contrast, Bayern experienced a damage of 43.2 ha (the second highest) through 19 fire ignitions (see Table 16).

Table 16. Burnt area in total and by forest type, and total number of fires, Federal Republic of Germany, 2008

	<i>Burnt area (ha)</i>			<i>Number of fires</i>
	<i>Coniferous forest</i>	<i>Broadleaves forest</i>	<i>Total</i>	
<i>Baden-Württemberg</i>	2.0	5.6	7.5	18
<i>Bayern</i>	23.6	19.6	43.2	42
<i>Berlin</i>	4.8	0.5	5.2	19
<i>Brandenburg</i>	208.6	156.4	365.0	340
<i>Bremen</i>	0.0	0.0	0.0	0
<i>Hamburg</i>	0.0	0.0	0.0	0
<i>Hessen</i>	1.4	0.3	1.7	20
<i>Mecklenburg-Vorpommern</i>	25.7	7.0	32.6	48
<i>Niedersachsen</i>	14.9	2.7	17.6	129
<i>Nordrhein-Westfalen</i>	2.6	0.2	2.8	18
<i>Rheinland-Pfalz</i>	1.0	0.3	1.3	15
<i>Saarland</i>	0.0	0.0	0.0	0
<i>Sachsen</i>	21.6	20.6	42.2	69
<i>Sachsen-Anhalt</i>	10.5	1.7	12.2	76
<i>Schleswig-Holstein</i>	0.5	5.5	5.9	5
<i>Thüringen</i>	1.2	0.1	1.3	19
<b><i>Germany</i></b>	<b>318.2</b>	<b>220.3</b>	<b>538.5</b>	<b>818</b>

The trend of the burnt areas, number of fires and average fire size in Germany for the years 1991-2007 are shown in Figure 16.

#### *Fire causes and impacts*

The main causes of forest fires during 2008 were the following:

- Carelessness – 288 ignitions (35 %)
- Deliberate or Arson – 200 ignitions (25 %)
- Natural – 33 ignitions (4 %)
- Unknown – 297 ignitions (36 %)

The economic damage caused by forest fires in 2008 is estimated to be 962 000 Euro, the yearly average from 1991 to 2008 being 2.3 million Euro. In 2008, 3.7 million Euro were spent on prevention measures and surveillance activities, mostly in eastern Germany.

*(Source: Federal Agency for Agriculture and Food, Germany)*

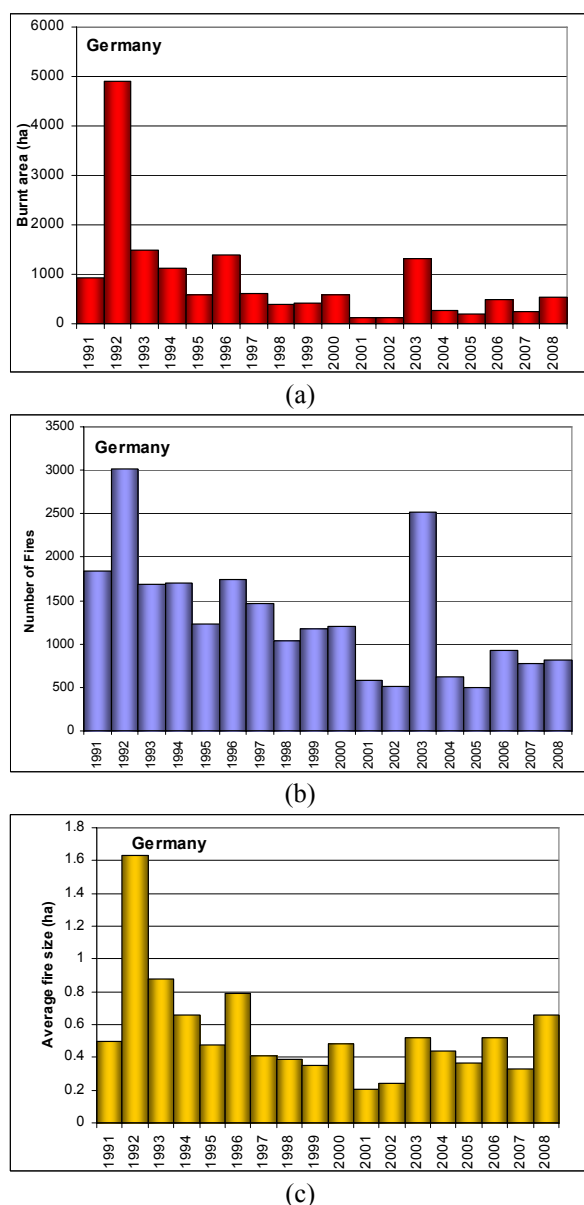


Figure 16. Burnt areas (a), number of fires (b) and average fire size (c) in Germany from 1991 to 2008.

### 2.1.11. Hungary

#### *Fire danger in the 2008 fire season*

The fire danger index rose steadily from April to July while it reached the maximum (very high) level. In the middle of June the threat was medium, after that in July it reached the top level. After a short decrease in August it again reached the top level.

The monthly mean temperature, excluding September, was above average, while the precipitation was average throughout the year and relatively high in summer time with several stormy days. February was very dry but in March there was a lot of snow. Concerning the spatial

distribution of the precipitation in Hungary, the rainy West and Southwest territories – Transdanubium and the mountain regions – had more than twice the precipitation of the middle of Alföld region.

#### *Fire occurrence and affected surfaces*

As can be seen from the comparison of the last two years (Table 17), the number of fires in rainy 2008 was not much less than in 2007 when the weather was much drier. On the other hand the burned area in 2008 was halved. Table 17 also shows that only 9-10% of the vegetation fires are forest fires in Hungary.

Table 17. Wildfires in Hungary in 2007 and 2008

Year		2007	2008
Number of wildfires		6691	6639
Forest fires in Hungary	Number of fires	603	502
	Total burned area (ha)	4636	2404
Fires in other land	Number of fires	6088	6137

During 2008 a total of 397 hectares of forest, 1 285 hectares of grass vegetation and 712 hectares of shrub vegetation were burned in forest fires (Table 18).

Table 18. Type of fuels affected in Hungary in 2008

Fuel model types	Type of vegetation	Total burnt area (ha)
Other land	Short grass	968
	Tall grass	327
Forested land	Broadleaf reforestation	95
	Coniferous reforestation	27
	Broadleaf stands	249
	Coniferous stands	26
Other wooded land	Shrubland	704
	Juniperus	8
TOTAL		2404

The burnt area, number of fires and average fire size for the years 1999-2008 are shown in Figure 17.



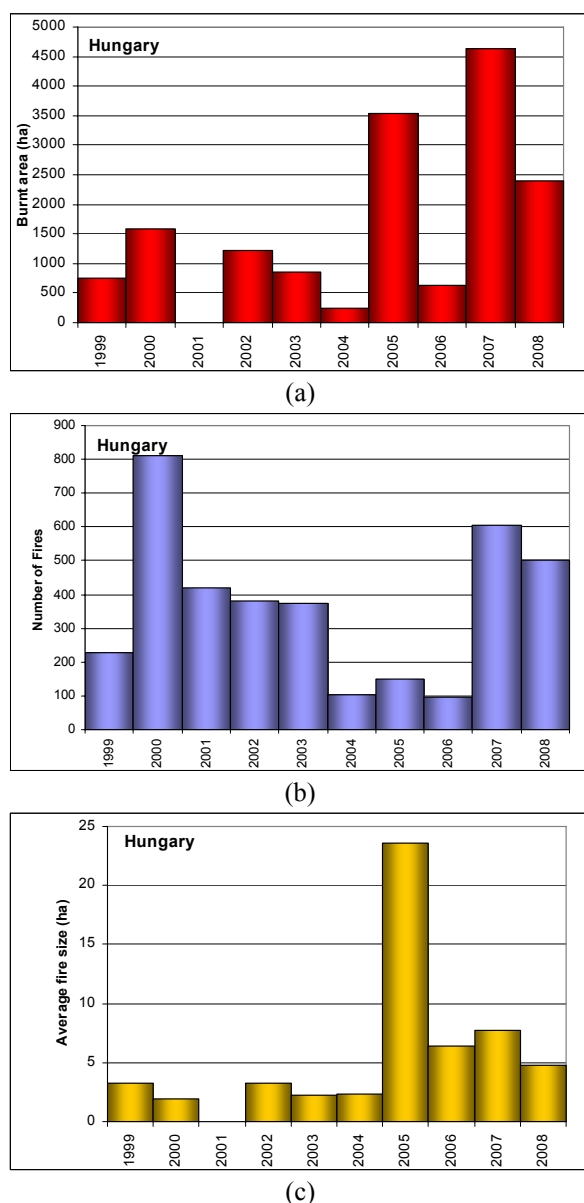


Figure 17. Burnt areas (a), number of fires (b) and average fire size (c) in Hungary from 1999 to 2008.

Some fires started in recently afforested or reforested lands burning 122 hectares. These plantations will have to be replanted.

Half of the area burned in forest fires was in short grass vegetation, as shown in Table 18. Forest fires are in close connection with vegetation fires.

Data of 2008 confirm that there are two distinct periods in Hungary where most forest fires (70% in 2008) are concentrated: February-April and July-August (Figure 18). In 2008 the interval between February and middle of March was the most critical; 50% of the fires started in this period. Grass and wasteland burning in early spring is part of traditional grassland use in Northern-Hungary, allowing the fire to spread easily to forests. A new phenomenon observed in 2008 is the high frequency of fires in September.

Most of the spring fires started in Northern Hungary, while during the summer they were mostly in the pine forests of the Alföld region, where the number of non-forest fires was also very high; one third of vegetation fires started in this region.

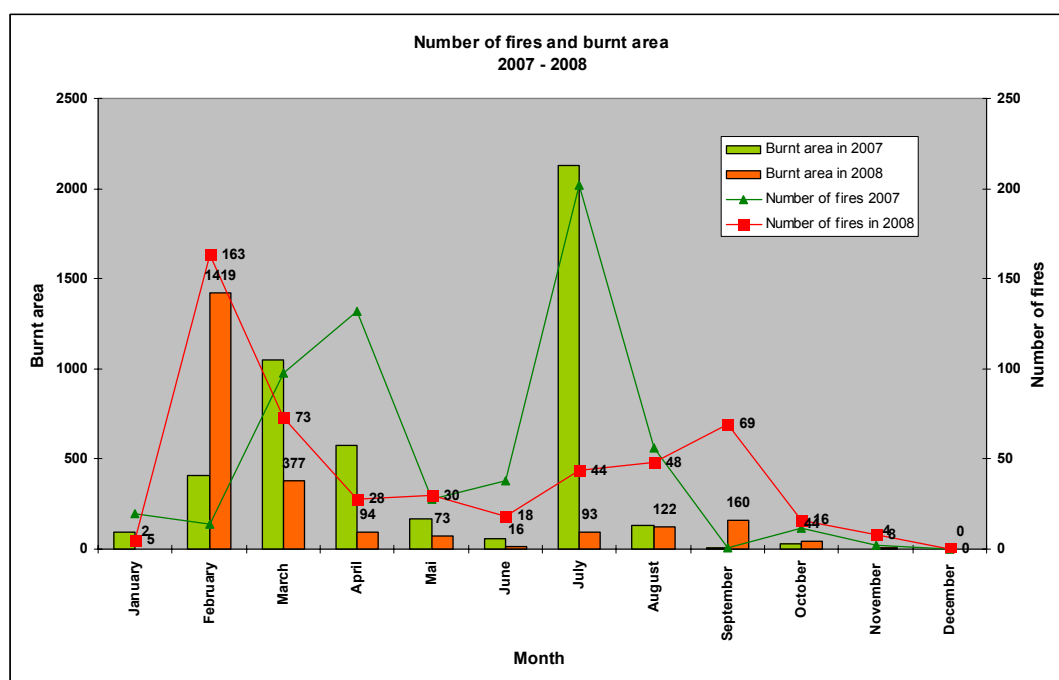


Figure 18. Monthly distribution of forest fires in Hungary in 2007 and 2008.

Table 19 – Forest fires in the Counties of Hungary in 2008

Counties of Hungary	Forest fires		Non forest fires
	Number of fires	Total burned area (ha)	Number of fires
Baranya county	41	113	243
Bács-Kiskun county	41	72	613
Békés county	15	86	288
Borsod-Abaúj-Zemplén county	71	637	590
Csongrád county	7	4	222
Fejér county	31	65	303
Győr-Moson-Sopron county	16	20	194
Hajdú-Bihar county	14	31	402
Heves county	34	281	401
Jász-Nagykun-Szolnok county	17	91	560
Komárom-Esztergom county	32	50	372
Nógrád county	35	210	239
Pest county	39	534	371
Somogy county	42	73	409
Szabolcs-Szatmár-Bereg county	9	24	391
Tolna county	15	19	100
Vas county	14	7	60
Veszprém county	18	54	106
Zala county	12	32	260
Budapest capital city	1	1	22
<b>TOTAL</b>	<b>502</b>	<b>2404</b>	<b>6137</b>

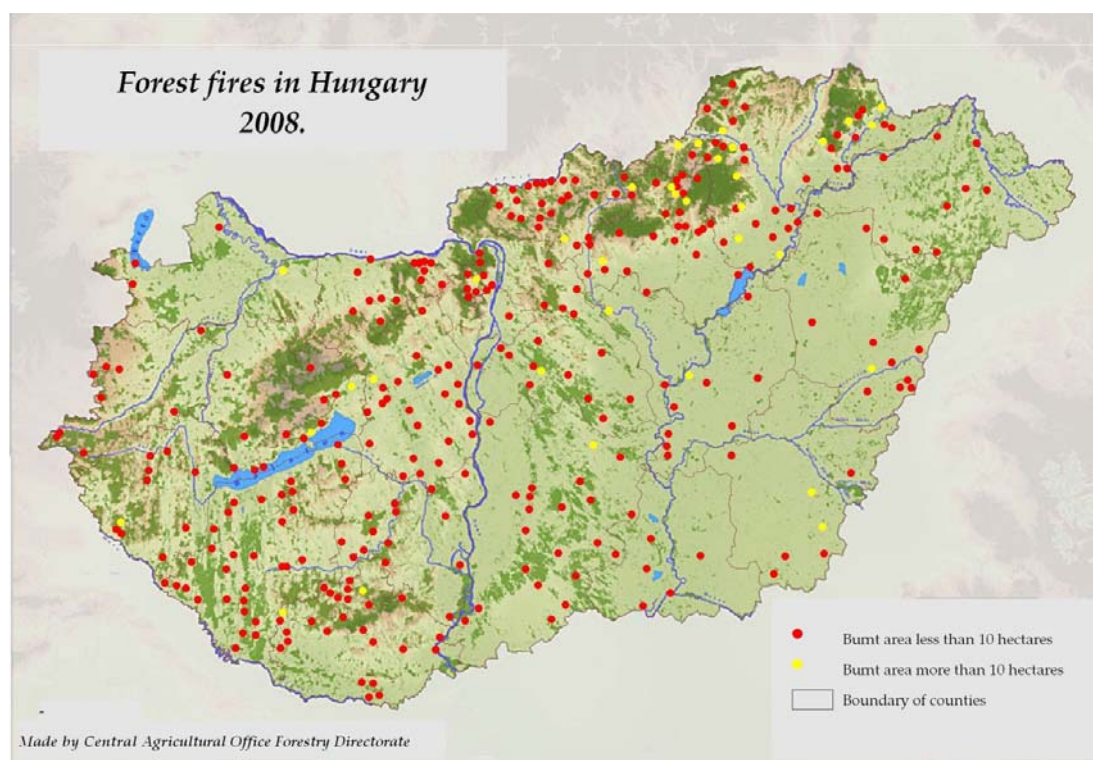


Figure 19. Forest fires in Hungary in 2008

**Fire size** The average burned area has decreased compared to previous years. During the rainy summer the average fire size was much less and there were no major fires in 2008.

Fires in Hungary can be classified into two categories. Surface fires smaller than 5 hectares or fires in newly afforested land are in the first category, larger surface fires and crown fires are in the second.

There were only a few exceptional fire events larger than 50 hectares (Table 20). Fires above 100 hectares are very rare in Hungary. There was only one case of a fire of that size in 2008.

The proportion of fires smaller than 1 hectare is 40%. The fires are detected early so that the fire service can start the fire-fight quickly. These are usually small intensity surface fires where dry grass and small branches are burning. Among fires below 1 hectare the average burned area was 0.16 hectare. Nearly 60% of fires are between 1-50 hectares. The average burned area of these fires is 5.4 hectares.

Table 20 – Size of forest fires in Hungary 2008

Size of forest fires	Forest fires	
	Number of fires	Burned area (ha)
< 1 ha	203	34
1 – 50 ha	292	1590
50 – 100 ha	6	380
100 – 500 ha	1	400
> 500 ha	-	-
<b>TOTAL</b>	<b>502</b>	<b>2404</b>

**Fire type** Ground fires were negligible in 2008 while 97% of forest fires (96% of the burned area) were surface fires. This is the most common fire type in Hungary. In 2008 there were 8 crown fires, burning a total area of 37 hectares (Table 21). The crown fires were in Bács-Kiskun county (4), in Northern-Hungary (3) and in Somogy county (1). Half of the crown fires were in spring while the others were in summer time.

Table 21. Type of forest fires in Hungary in 2008

<i>Type of forest fires</i>	<i>Forest fires</i>	
	<i>Number of fires</i>	<i>Burnt area (ha)</i>
<i>Ground fire</i>	5	45
<i>Surface fire</i>	489	2322
<i>Crown fire</i>	8	37
<i>TOTAL</i>	502	2404

**Fire causes** Fires were 95% human caused. Most fires started because of negligence, and only few of them were caused by arsonists (Table 22). Typical forest fire causes are incorrectly extinguished fires of hikers and illicit agricultural fires. Natural cause is not relevant in Hungarian forests. 43% of total burnt area occurred after poorly extinguished fires.

In many cases the cause of fire is the badly handled wasteland or grass fires spreading to the forest, or bad handling during slash burning in the intensively handled forests.

There are a lot of fires with unknown causes, as the cause of fire is not verifiable directly in many cases. The Hungarian fire investigators register a cause as unknown if the circumstances that caused the fire were undefined.

Table 22. Forest fire causes in 2008 in Hungary

<i>Cause of fire</i>	<i>Forest fires</i>	
	<i>Number of fires</i>	<i>Burnt area (ha)</i>
<i>Unknown</i>	284	1185
<i>Natural</i>	1	1
<i>Negligence</i>	172	1070
<i>Arson</i>	45	148
<i>TOTAL</i>	502	2404

### *Loss of human lives*

There were no casualties among fire fighters and civilians during fire fighting in 2008. The equipment of fire service was not heavily damaged. There were no deaths or injury to personnel during fire fighting.

### *Fire fighting means and information campaigns*

Fires were extinguished on average 1-3 hours after the alarm was raised. Fire services arrived at the fire in an average of 30 minutes. Small fires were extinguished within one hour on average.

Fire prevention and fire fighting activities were presented very well by spokesmen for disaster

management and forest authorities and by media in the frame of awareness-rising campaigns during the last fire season. They organised media events such as press conferences, short reports and announcements in newspapers and on the radio and TV. Supplying of data from the fire database to forest owners, managers and to media is a daily task.

Size and content of information boards about forest fires have been standardized and can be installed at excursion places in forest areas and beside motorways. Preparation of two types of fire ban boards was prepared by the CAO FD last year. Information and fire ban boards (55 large size and 1000 small size) were distributed for forest managers at the end of 2008 / beginning of 2009.

Presentations and demonstrations about forest fire prevention and suppression were organised by CAO FD for fire managers and forest managers. The web page of CAO FD with fire prevention information is under development and continuously updated.

*(Source: State Forest Service, Central Agricultural Office, Forestry Directorate, Hungary)*

## 2.1.12. Latvia

### *Fire danger in the 2008 fire season*

The 2008 fire season in Latvia was an average one. Most of the fires were in spring and early summer. In July and August, due to sufficient precipitation, there was a decrease in the number of forest fires.

### *Fire occurrence and affected surfaces*

In 2008, there was a total of 700 forest fires recorded; the number of forest fires decreased, compared to the average number of fires for the past 10 years (910). The total burned area in forestlands was 364 ha (against 3 387 ha in 2006). In 91.4% of the cases, the fire was detected and localized before the burned area was larger than 1 ha.

As usual, the highest number of forest fires was in the environs of Latvia's two biggest cities – Rīga and Daugavpils (298 and 197 cases with a burned area of 135 and 67 ha, respectively). Figure 21 show loci and size of forest fires in 2008. The 2008 biggest forest fire (71 ha) occurred in the Daudzese Community (Sēlijas Regional Forest District).

In 2008, the State Forest Service continued improving the forest fire database where, by using GIS, the coordinates of the loci of fire were recorded. It has enabled the mapping of the forest fire situation, which is convenient for analyses. At present the SFS is developing a system for feeding the fire-affected areas into the database as polygons.

### *Fire fighting means*

The State Forest Service involved the State Fire and Rescue Service of the Ministry of Interior for putting the biggest fires under control. Also 5 aerial fire suppression operations were organised, using the National Armed Forces helicopter MI-8 with Bambi Bucket system.

### *Injuries and loss of human lives*

There was no loss of human lives in forest fires in 2008.

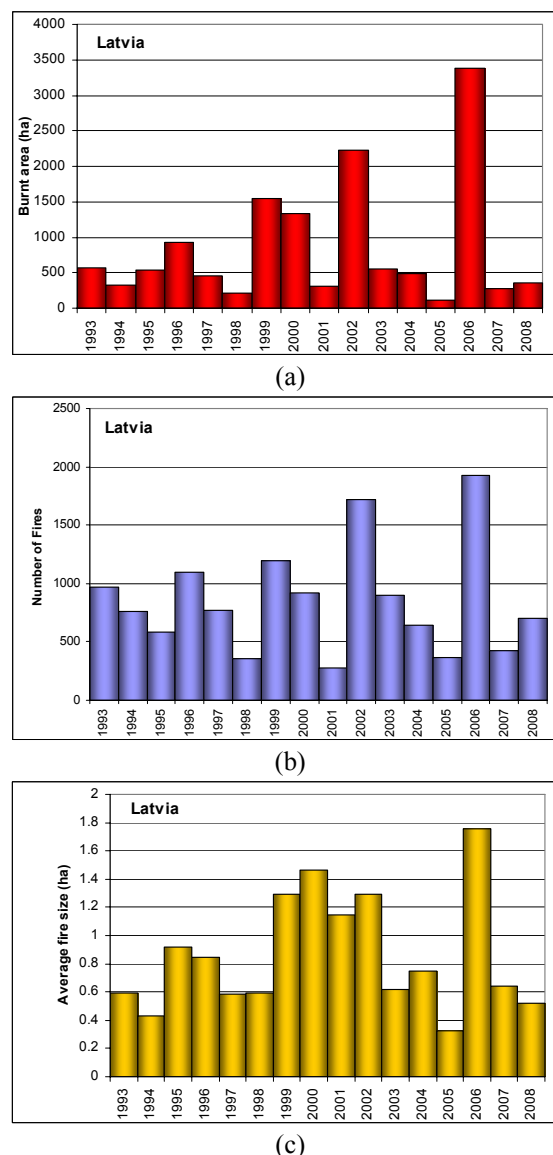


Figure 20. Burnt areas (a), number of fires (b) and average fire size (c) in Latvia from 1993 to 2008.

(Source: State Forest Service, Forest Fire Control Unit, Latvia)

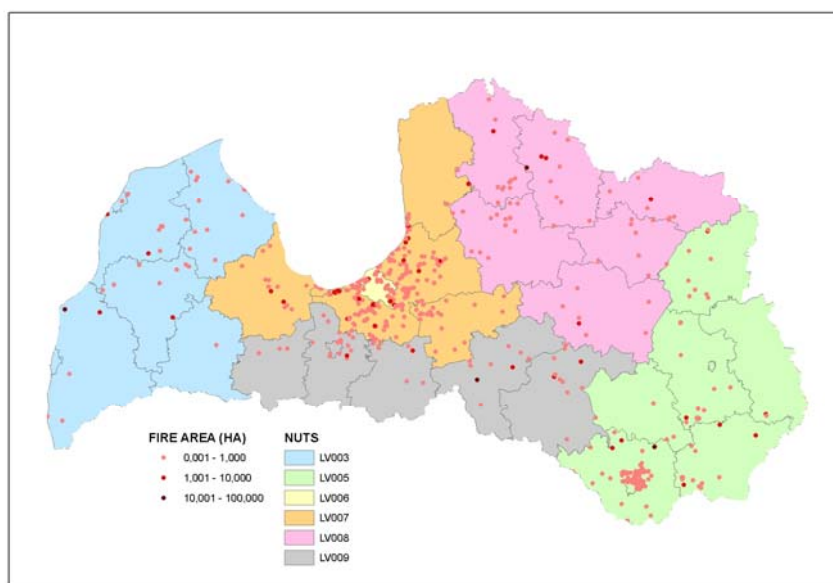


Figure 21. Map of forest fire locations in Latvia in 2008

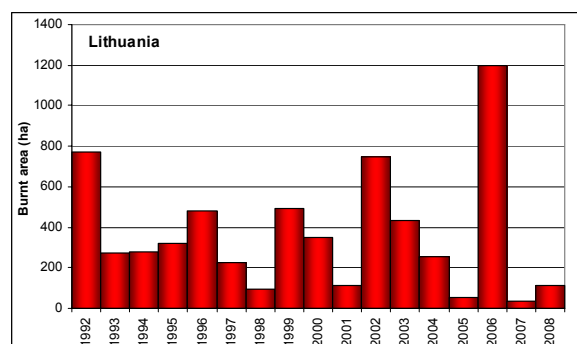
### 2.1.13. Lithuania

In 2008, according to the data of the Directorate General of State Forests, 301 forest fires occurred and damaged 112.4 ha of forest. Compared with the previous 16 years, both the number of fires and the total burned forest land area were very low. The total damage was estimated to be 93 000 Euro. Average burnt area was approximately 0.37 ha. The yearly trends in terms of number of fires and burnt area during the last 17 years in Lithuania are shown in Figure 22.

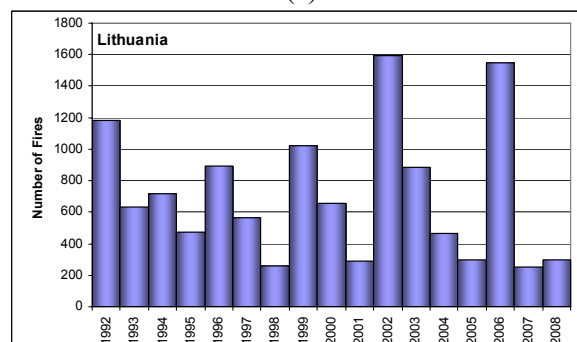
#### *Injuries and loss of human lives*

No casualties were reported in Lithuania during the fire season of 2008.

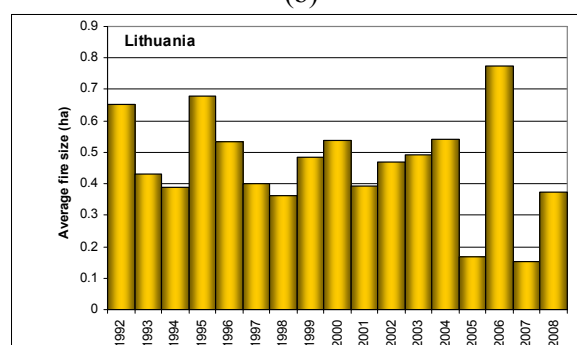
(Source: Ministry of Environment, Forests Department, Lithuania)



(a)



(b)



(c)

Figure 22. Burnt areas (a), number of fires (b) and average fire size (c) in Lithuania from 1992 to 2008.



## 2.1.14. Poland

### *Fire danger in the 2008 fire season*

The year 2008 was characterized by a forest fire danger generally similar to the previous year and to the period 2001-2005, that was mostly a result of meteorological conditions that were not favourable to fires. May and June were exceptions. Diagrams in Figure 23 to Figure 26 depict values of air temperature, precipitation, pine duff moisture content (*Pinus sylvestris* L.) and the national degree of forest fire danger risk (NDFFDR) in the 2008 fire season. The number of fires occurring during the year is also represented.

The highest forest fire danger risk (significantly higher than in the multi-year period 2001-2005) occurred in June 2008 (NDFFDR = 2.4) and in May and July it was higher than in the multi-year period by 0.3. In the remaining months, it was lower by 0.3-0.5. The mean degree of forest fire danger risk for Poland (NDFFDR = 1.7) was similar to the value referred to as “high risk” (corresponding to “2” in the forecast scale). In comparison with the previous year, fire danger during the season was higher by 0.1.

The share of occurrence of the third degree of forest fire danger risk for the fire season amounted to, on average, 30% and was slightly higher (by 3-5%) than the multi-year value. In July, it reached 62%, i.e. it was twice as high as in 2001-2005; in May (48%) it exceeded the multi-year average by 14%, but in September, it amounted to only 3-4% and in August (15%) it was lower by half than in the multi-year period.

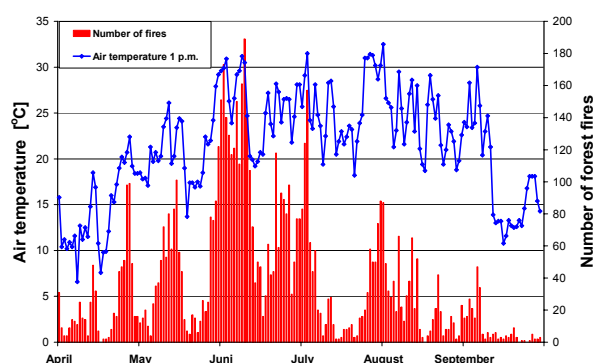


Figure 23. The air temperatures and numbers of forest fires in fire season 2008

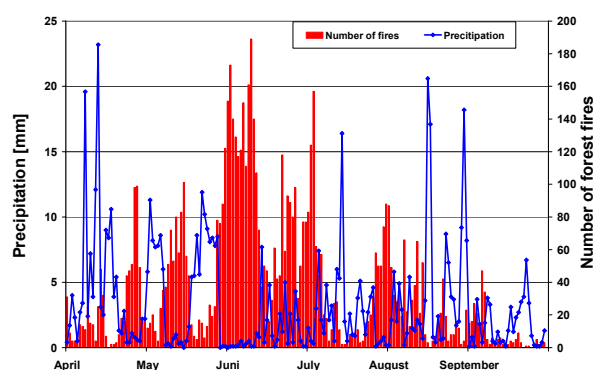


Figure 24. Precipitations and numbers of forest fires in fire season 2008

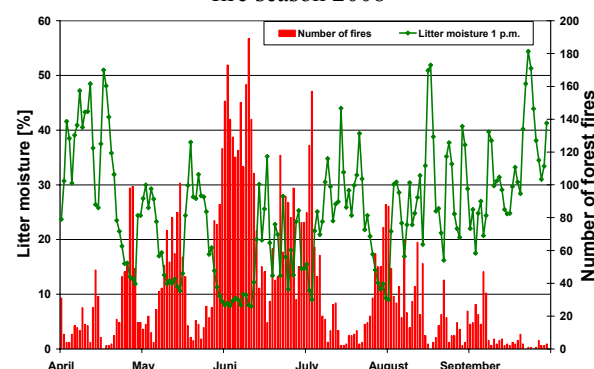


Figure 25. Litter moisture and numbers of forest fires in fire season 2008

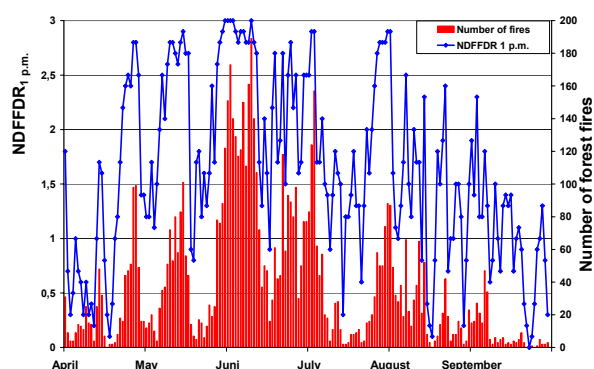


Figure 26. The National Degree of Forest Fire Danger Risk and numbers of forest fires in fire season 2008

### *Fire occurrence and affected surfaces*

In total, in 2008, there were 9 091 fires in Poland, which burned 3 028 ha (Table 23 and Figure 28). The average area per forest fire reached the lowest value ever recorded (0.33 ha).

The month with the highest number of fires was June (36% of fires, i.e. 3 295), higher by 23% than in the period 2001-2005. In terms of number of fires, the following months were May (17%) and July (15%) and then April and August (10%). The lowest number of fires in the fire season occurred in September (4%, i.e. 266), that is,

almost 4 times less than the average in the multi-year period. These data are shown in Figure 27.

The total number of fires in early Spring (April-May) was visibly lower (27%) than the number of fires in the previous year (67%) and the multi-year average (40%) from the period 2001-2005. 92% of fires occurred in the fire season, i.e. more than in the multi-year period (88%).

Table 23. . Forest fire database for Poland in the period 1994-2008

Year	Number of forest fires	Burned area [ha]	Forest fires average area [ha]
1994	10 710	9 171	0,86
1995	7 681	5 306	0,69
1996	7 924	14 120	1,78
1997	6 818	6 598	0,97
1998	6 166	4 019	0,65
1999	9 820	8 307	0,85
2000	12 428	7 013	0,56
2001	4 480	3 429	0,77
2002	10 101	5 593	0,55
2003	17 088	28 554	1,67
2004	7 219	4 338	0,60
2005	12 803	7 387	0,58
2006	11 828	5 912	0,50
2007	8 305	2 844	0,34
2008	9 091	3 028	0,33
<i>Yearly Average in the Period</i>			
1996-2000	8 631	8 011	0,93
2001-2005	10 338	9 860	0,95

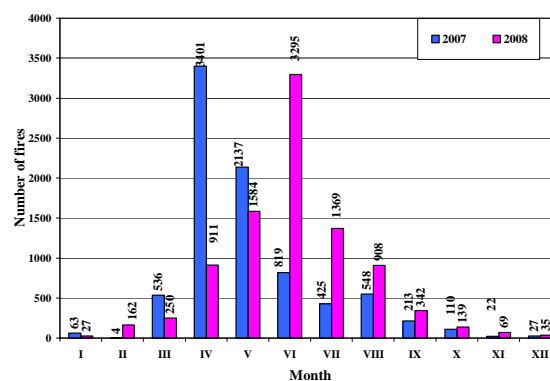


Figure 27. Distribution of number of forest fires by months in 2007 and 2008 in Poland

In 2008, the highest number of fires (20%), 1% less than in 2007, occurred in the Mazowieckie Voivodeship (1 780) and in the Wielkopolskie Voivodeship (12%, i.e. 1 075). More than 400 fires occurred in the Silesian (838), Kujawsko-Pomorskie (816), Lubuskie (789), Łódzkie (645), Dolnośląskie (627), Świętokrzyskie (524) and Zachodniopomorskie (478) Voivodeship. The lowest number of forest fires occurred in the Opolskie (116) and Warmińsko-Mazurskie Voivodeship (155).

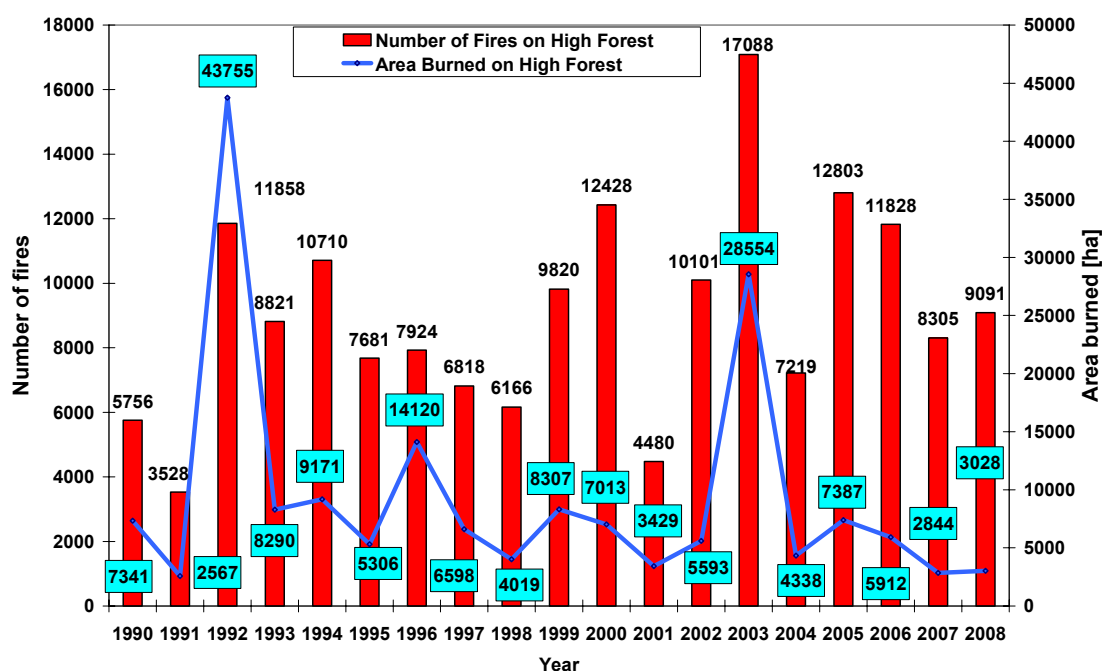


Figure 28. Total number of fires on high forest and area burned in Poland in the period 1990-2008



The largest areas of burnt forests were reported in the Mazowieckie (517 ha) and Silesian (365 ha) Voivodeship, i.e. 17 and 12% of the total area, as well as in the Wielkopolskie (261 ha), Dolnośląskie (224 ha), Lubuskie (223 ha) and Łódzkie (212 ha) Voivodeship. The smallest areas were located in the Opolskie (35 ha) and Warmińsko-Mazurskie (42 ha) Voivodeship. These data are depicted in Figure 29, Figure 30 and Figure 31.

Small forest fires (with an area lower than 1 ha) constituted 92% of all the forest fires in 2008 (Figure 32) with a total burnt area amounting to 39%. The highest share of burnt area (44%) concerned fires between 1 and 10 ha, the number of which amounted to 7%.

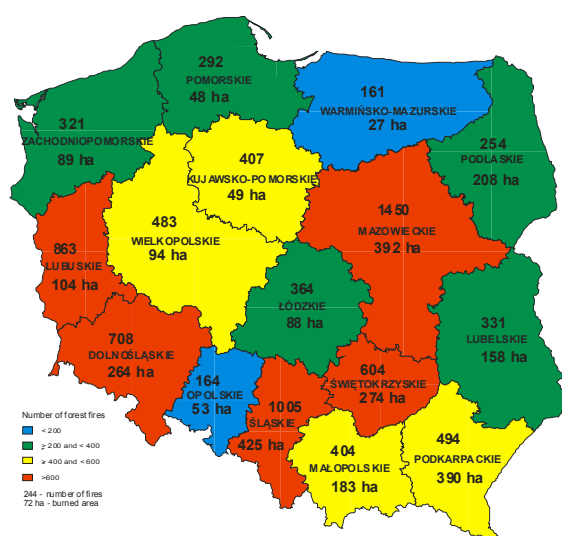


Figure 29. Number of forest fires and burned areas by provinces of Poland in 2007

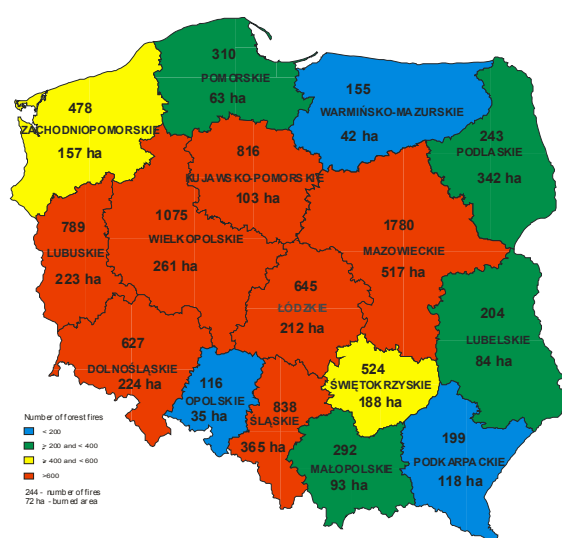


Figure 30. Number of forest fires and burned areas by provinces of Poland in 2008

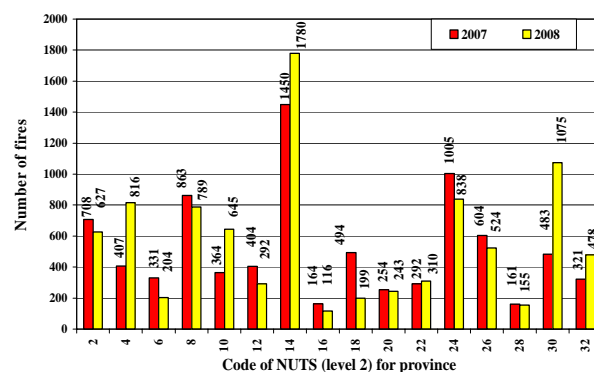


Figure 31. Distribution of the number of forest fires by province (NUTS level 2) in 2007 and 2008 in Poland

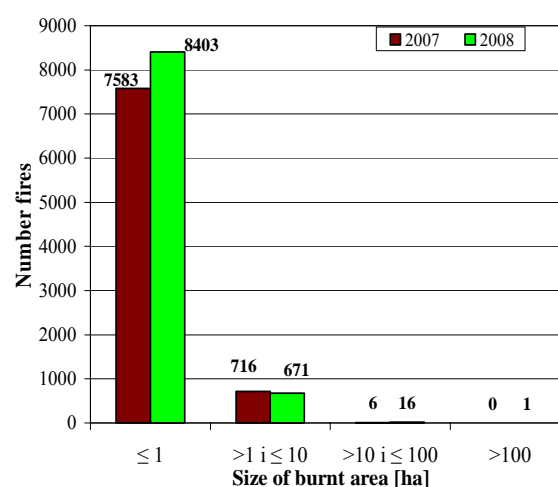


Figure 32. Distribution of the number of forest fires by size of burnt area in the years 2007 and 2008 in Poland

### Fire causes

The main cause of forest fires was man-made activities; arson accounted for almost half of the cases (47%), carelessness for 37%, unknown over 15% (Figure 33)

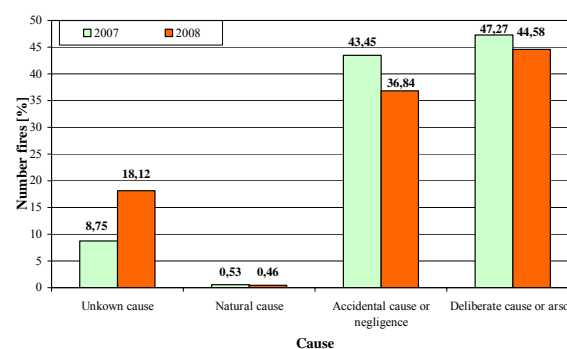


Figure 33. Distribution of the number of forest fires by causes in 2007 and 2008 in Poland

The burnt area, number of fires and average fire size for the years 1990 – 2008 are shown in Figure 34.

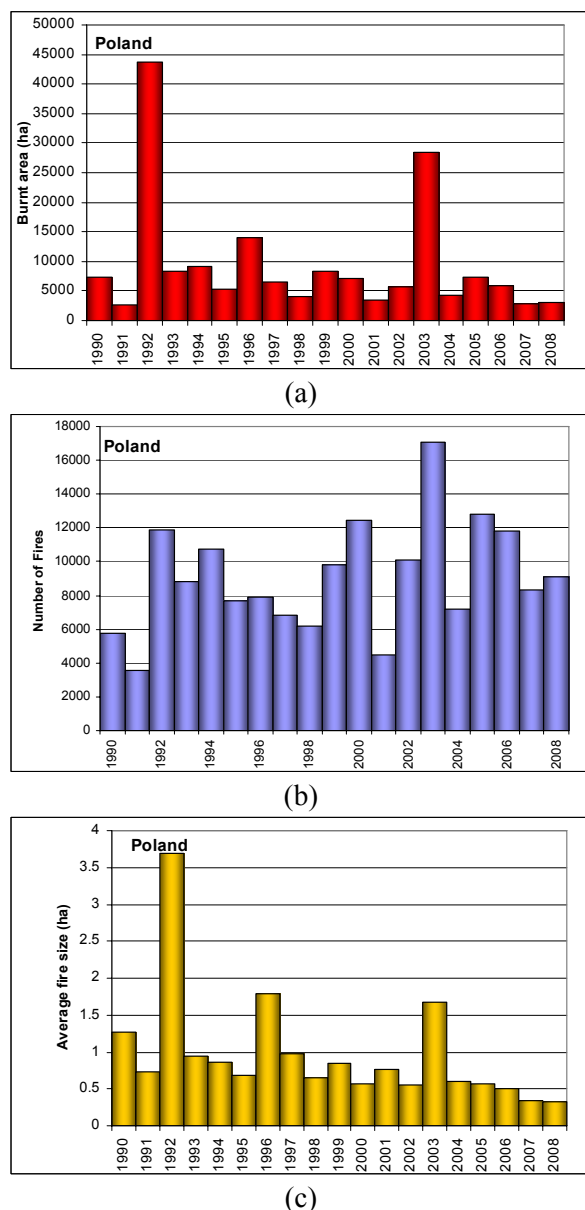


Figure 34. Burnt areas (a), number of fires (b) and average fire size (c) in Poland from 1990 to 2008.

### *Losses and damage caused by fires*

The amount of losses caused by forest fires in individual years in the period 1994–2008 is depicted in Table 24. According to this information, total losses in the analysed period amounted to ca. €124 million). These losses are visibly differentiated and range from ca. €3 million in 2001 to €23 million in 2003. In 2008, these losses amounted to ca. €6 million and were lower than the multi-year averages and slightly higher than in 2007. The calculated average value of 1 ha of forest in Poland is €9 804. The value of

forests (high forest) only in the area affected by fires in the years 2007 and 2008 amounted to €20 million and €21 million, i.e. lower by half than in 2006. The estimated value of direct losses amounted to 27% and 30% of their value, respectively.

Table 24. Losses caused by forest fires in the period 1994-2008 in thousand €

Year	Losses Caused by Forest Fires [thousand € <sup>2</sup> ]
1994	8 182
1995	6 201
1996	12 621
1997	7 648
1998	4 979
1999	10 532
2000	7 477
2001	3 178
2002	4 546
2003	23 403
2004	2 902
2005	11 461
2006	9 518
2007	5 246
2008	6 139
Total 1994-2008	124 034
Total 1996-2000	43 257
Total 2001-2005	45 490
<i>Yearly Average in the Period</i>	
1996-2000	8 651
2001-2005	9 098

<sup>2</sup> \*) 1 € = PLN 4.5678 according to the exchange rate of 28<sup>th</sup> April, 2009

On the basis of the amount of plant biomass per area unit that was burnt in the forests and on undeveloped lands, the amount of carbon dioxide (CO<sub>2</sub>) that was emitted during the fires was calculated. In the calculations, the type of fire and amount of plant biomass burnt were taken into account, assuming the value of 82 t/ha (soil cover fire and ground fire) for forests, 94 t/ha (total fires) and 55 t/ha for undeveloped lands. Detailed information can be found in Table 25. These values are differentiated depending on the year. In total, in the period 1994-2008, as a result of fires, 12.9 million tons of CO<sub>2</sub> were emitted (from ca. 0.3 million tons in 2007 to ca. 3.2 million tons in 2003). In 2008, ca. 0.3 million tons of CO<sub>2</sub> were emitted, i.e. slightly more than in 2007, constituting 1/3 of the multi-year averages (ca. 0.9 million tons). Apart from that, ca. 32 000 tons of carbon monoxide, 12 000 tons of solid and liquid particles (fumes), 3 000 tons of hydrocarbons and 1 000 tons of nitrogen oxides were emitted into the atmosphere.

Table 25. The quantities of CO<sub>2</sub> [thousand ton] emitted as result of forest fires in the period 1994-2008

Year	CO <sub>2</sub> [thousand tons] emitted from forest fires
1994	1 016
1995	574
1996	1 547
1997	724
1998	440
1999	939
2000	784
2001	383
2002	625
2003	3 216
2004	481
2005	819
2006	655
2007	315
2008	336
Total 1994-2008	12 854
Yearly Average	891
Total 1996-2000	4 434
Yearly Average	887
Total 2001-2005	5 524
Yearly Average	1 105

#### *Fire fighting means and information campaigns*

In 2008, within the confines of information and propaganda activities, the following actions were taken:

- 12 000 lectures in schools, at summer camps and town community meetings;
- 9 000 information tables were placed;
- in almost 500 interviews on the radio and TV, statements and information concerning forest fire danger and fire protection-related issues were provided;
- more than 500 articles and pieces of information were published in local press of country-wide range;
- 400 fire protection-related competitions for children and young people were organised.

In forest areas, within the confines of preventive actions, work was carried out in order to prevent fires and limit forest fire propagation. Within the confines of this work, 7 498 km of firebreak belts were renewed and 121 km of new firebreak forest belts were made. Flammable materials were removed from 34 581 ha of forest areas.

In 2008, the forest area observation system was subject to further improvement and consisted of:

- 640 ground observation posts, including 176 TV observation posts,
- 10 patrol planes.

2 new observation posts were built. Repair and maintenance work was conducted on 40 posts. It is necessary to build ca. 50 observation posts, including replacement of 26 wooden fire observation posts.

In 2008, the effectiveness of the State Forests observation network was as follows:

- observation posts detected 46% of the total number of forest fires. The highest index of fire detection by towers was achieved by the Regional Directorate of State Forests in: Szczecin (68%), Zielona Góra (57%) and Radom (56%).
- fire patrols and employees: 9% of fires.
- planes and helicopters: 3% of the total number of fires.

Apart from that, outsiders detected 42% of all fires.

The emergency communications network of the State Forests consisted of: 7 933 radiotelephones, including:

- 1 346 base ones,
- 3 145 portable ones,

- 3 442 walkie talkies.

The water supply tanks network was extended by 76 new points. Currently, the network consists of:

- 5 134 natural water abstraction points,
- 2 316 artificial water abstraction points,
- 9 500 fire hydrants.

Unaided, the State Forests units suppressed 7% of the total number of fires. The remaining fires were suppressed by voluntary fire brigades and units of the State Fire Service. Planes and helicopters participated in 1 015 firefighting actions, making 3 720 drops of firefighting agents.

The cost of fire protection of the State Forests amounted to €15.5 million (in 2007: €14.4 million).

(Source: Forest Research Institute, Forest Fire Protection Department., Poland)

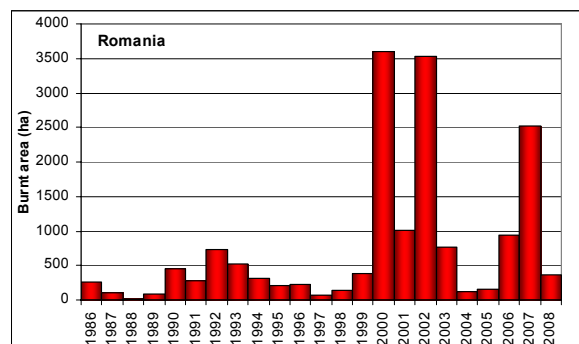
### 2.1.15. Romania

In Romania, the year 2008 was warmer than in the reference period (1961-1990), with average temperature 1.4°C higher. Thus, in 2008, the average temperatures in the whole country exceeded 0.5-2.7°C in relation to the reference period, except in September when the average value was 0.7°C lower than normal.

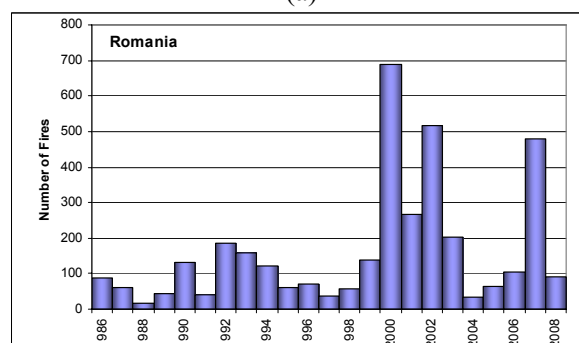
The average quantity of precipitation in 2008 was 674 l/m<sup>2</sup> for the entire country. The surplus of precipitation recorded in March, April, July, September, October and December, in spite of the reduced precipitation registered in the other months, determined an average precipitation that was 5.5% higher compared to the reference period. On the contrary, in August there was a deficit deviation of 57.3% recorded, comparing with normal values.

Due to the relatively high precipitation values and decreased soil humidity deficits, the year 2008 could be considered as normal, compared with previous years.

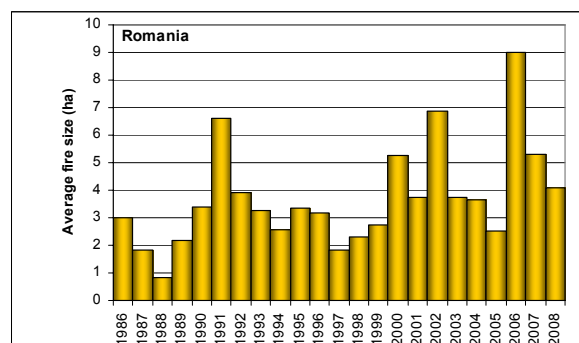
Therefore, the climatologic and hydrological conditions of the year 2008 led to a reduced number of forest fires and burnt surface all over Romania (as seen in Figure 35).



(a)



(b)



(c)

Figure 35. Burnt area (a), number of fires (b) and average fire size (c) in Romania from 1986 to 2008

The National Forests Administration (ROMSILVA) assured measures for prevention and suppression of forest fires, including the activity of protecting the forestry domain under administration against other damaging activities, such as illegal tree cutting, degrading, illegal pasture or poaching. The Administration also cooperated with the territorial environmental agencies to assure the limitation of other anthropical activities with adverse impact.

The co-ordination of the suppression activity was carried out, depending on the magnitude and location of the forest fire event, by the forestry personnel or in cooperation with the fire fighter units.

(Source: Ministry of Environment, Romania)

### 2.1.16. Slovak Republic

#### *Fire danger in the 2008 fire season*

The 2008 fire season was not critical from the point of view of fire danger. The majority of fires were in spring and early summer.

#### *Fire occurrence and affected surfaces*

A total of 182 forest fires were reported in Slovakia in 2008. The total burnt area was 118 ha. The average burnt forest area per fire was 0.65 ha.

Forest fire causes for the years 2002 – 2008 are shown in Table 26. The burnt area, number of fires and average fire size for the years 1999 – 2008 are shown in Figure 36.

#### *Injuries and loss of human lives*

Two injuries were reported in 2008.

*(Processed: National Forest Centre - Forest Research Institute Zvolen, Slovak Republic; Source: Institute for Fires and Expertise of the Ministry of Interior of Slovak Republic)*

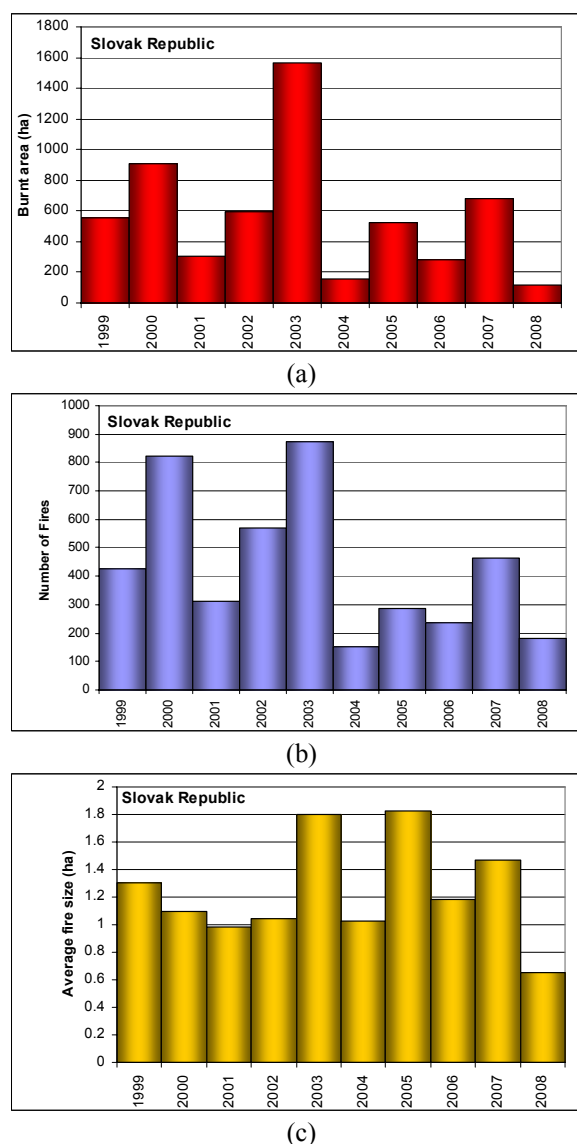


Figure 36. Burnt areas (a), number of fires (b) and average fire size (c) in the Slovak Republic from 1999 to 2008.

Table 26. Fire causes in Slovak Republic in 2002 – 2008 (number of forest fires).

<i>Fire Cause</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>
Arson	18	31	8	7	8	11	7
Negligence	525	780	138	261	201	416	154
Natural (lightning)	4	3	1	2	3	6	1
Unknown causes	23	38	8	16	25	26	20
<b>Total</b>	<b>570</b>	<b>852</b>	<b>155</b>	<b>286</b>	<b>237</b>	<b>463</b>	<b>182</b>
<b>Negligence subcategories:</b>							
Agricultural operations	239	280	38	91	26	121	30
Logging and forest operations	4	2	2		14	29	24
Other industrial activities	17	12	0	1	3	2	25
Communications (railways, power lines, etc.)	2	3	1	0	2	3	3
General public (campers, children etc.)	263	475	96	163	191	308	94
Other (military, etc.)	4	6	1	4	1	0	6

### 2.1.17. Slovenia

In 2008, according to the data of the Forest Service, 74 forest fires were reported, a total burned area of 75.38 ha, of which 35.52 of forest land. Compared with the previous 6 years, the number of fires was below the average and the total burned area was very low. The average burnt area was approximately 1.02 ha. The yearly trends in terms of number of fires and burnt area during the last 7 years in Slovenia are shown in Figure 37.

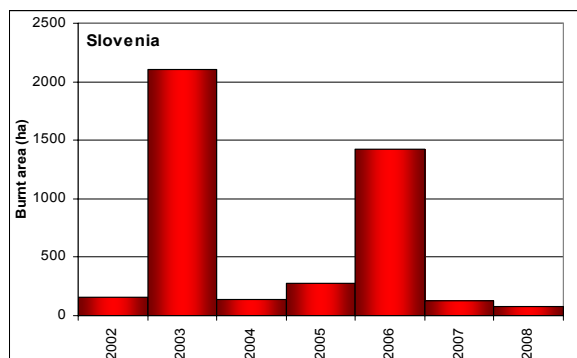
Table 27. Fire causes in Slovenia in 2008 (number of forest fires).

<i>Fire Cause</i>	<i>2008</i>
Arson	2
Negligence	41
Natural (lightning)	1
Unknown causes	30
<b>Total</b>	<b>74</b>
<b>Negligence subcategories:</b>	
Agricultural operations	18
Logging and forest operations	1
Other industrial activities	0
Communications (railways, power lin., etc.)	18
General public (campers, children etc.)	2
Other (military, etc.)	2

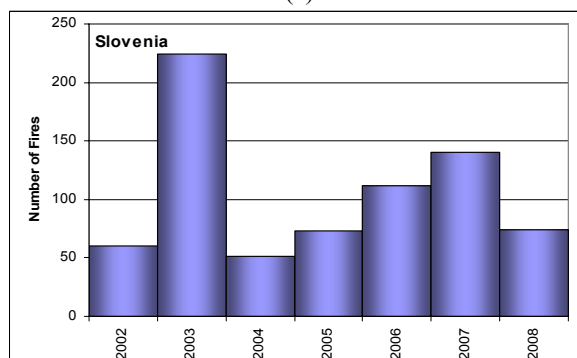
#### *Injuries and loss of human lives*

No casualties were reported in Slovenia during the fire season of 2008.

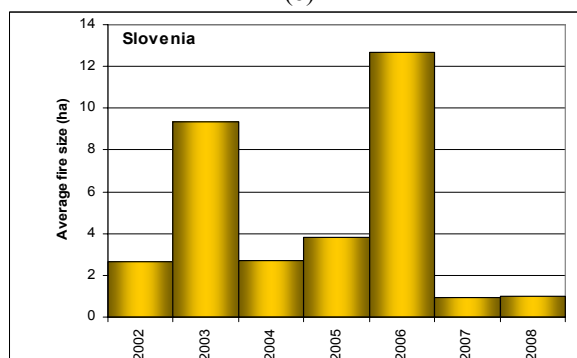
(Source: Forest Service, Slovenia)



(a)



(b)



(c)

Figure 37. Burnt areas (a), number of fires (b) and average fire size (c) in Slovenia from 2002 to 2008

Table 28. Number of fires and burned area by forest management unit in Slovenia in 2008.

<i>Forest management unit</i>	<i>Number of fires</i>					<i>Burned area (ha)</i>			
	<i>&lt;1 ha</i>	<i>&gt;=1 ha</i>	<i>&gt;100 ha</i>	<i>&gt;500 ha</i>	<i>Total</i>	<i>Wooded area</i>	<i>Bushes</i>	<i>Non wooded area</i>	<i>Total</i>
<i>Tolmin</i>	0	2	0	0	2	1.3	3.6	0	4.9
<i>Bled</i>	3	1	0	0	4	6	0.5	0	6.5
<i>Kranj</i>	2	0	0	0	2	0.16	0	0.08	0.24
<i>Ljubljana</i>	9	4	0	0	13	9.27	0	0	9.27
<i>Postojna</i>	3	1	0	0	4	0	0.55	6.7	7.25
<i>Kočevje</i>	0	0	0	0	0	0	0	0	0
<i>Novo mesto</i>	4	0	0	0	4	1.33	0	0	1.33
<i>Brežice</i>	1	1	0	0	2	8.04	0	0.1	8.14
<i>Celje</i>	5	0	0	0	5	0.47	0.13	0.65	1.25
<i>Nazarje</i>	0	0	0	0	0	0	0	0	0
<i>Slovenj Gradec</i>	0	0	0	0	0	0	0	0	0
<i>Maribor</i>	4	0	0	0	4	0.52	0	0	0.52
<i>Murska Sobota</i>	0	0	0	0	0	0	0	0	0
<i>Sežana</i>	24	10	0	0	34	8.43	6.39	21.16	35.98
<b>Total</b>	<b>55</b>	<b>19</b>	<b>0</b>	<b>0</b>	<b>74</b>	<b>35.52</b>	<b>11.17</b>	<b>28.69</b>	<b>75.38</b>

## 2.1.18. Sweden

### *Fire danger in the 2008 fire season*

The fire danger was high in the beginning of the season in some parts of the country. This year was rather extreme with high values of the FWI-index and some fires were also threatening houses. Some families were therefore evacuated from their houses but no house was burned.

### *Fire occurrence and affected surfaces*

During 2008, 5 420 fires were recorded, burning 4 280 ha of forest land, 1 377 ha of other wooded land and 456 ha of other land.

The largest recorded fire started on 30<sup>th</sup> of May and ended 11<sup>th</sup> of June 2008 in the Nordanstig municipality. In this event about 1 170 ha of forest were burned. There were several other fires at this time since it was a period with dry weather and high temperatures. Figure 40 shows an image of the fire prognosis by EFFIS from 10<sup>th</sup> of June 2008. It shows an extreme high FWI-index in the south west part of Sweden. Some days in this period also had strong winds.

Figure 38 and Figure 39 show the pattern of fire occurrence and burnt area by month during the year. The burnt area, number of fires and average fire size for the years 1999 – 2008 are shown in Figure 41.

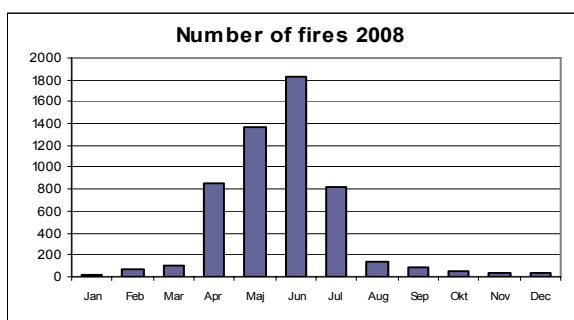


Figure 38. Fire frequency by month in 2008

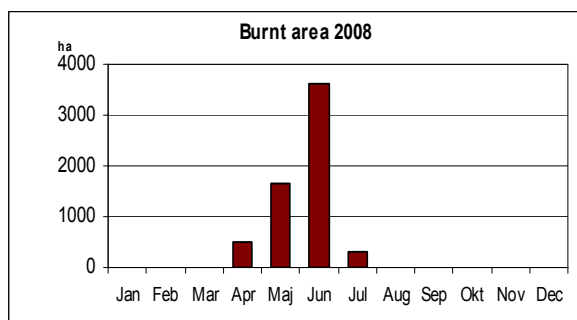


Figure 39. Burnt area by month in 2008

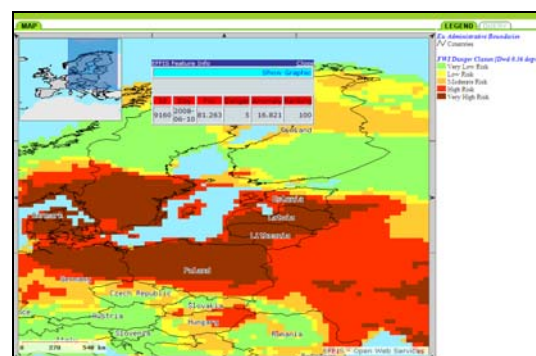
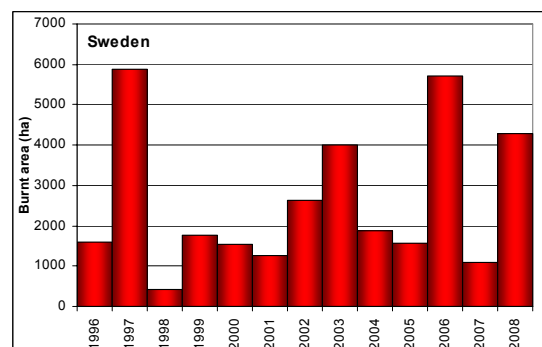
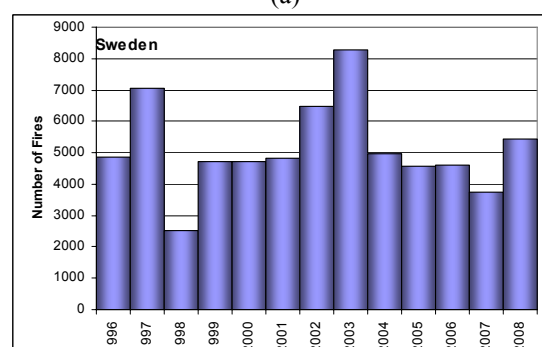


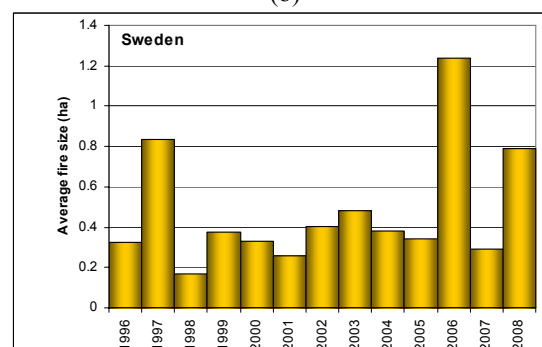
Figure 40. EFFIS fire danger forecast of 10/06/2008.



(a)



(b)



(c)

Figure 41. Burnt areas (a), number of fires (b) and average fire size (c) in Sweden from 1996 to 2008.

(Source: Swedish Civil Contingencies Agency Risk & Vulnerability Department, Natural Hazards & Critical Section, Sweden).



## 2.2. EU CANDIDATE COUNTRIES

### 2.2.1. FYROM

The Republic of Macedonia covers a total area of 25 713 km<sup>2</sup>, with 997 000 ha of forest land and 1 244 000 ha of agricultural land.

As a result of very specific natural and geographical features, there are two climatic types that collide in Republic of Macedonia: Mediterranean and continental, which results in cold and severe winters and hot and dry summers. The annual average air temperature is 11.3 degrees Celsius, with average precipitation of 983.7 mm/m<sup>2</sup> and average sunshine period of 2450 hours per year.

#### *Fire danger in the 2008 fire season*

The fire danger in 2008 in Macedonia was at an average level. The majority of fires occurred in the late spring and during the summer months.

#### *Fire occurrence and affected surfaces*

During the year 2008 there were 2515 fires of which 573 were forest fires, affecting in total an area of 11 022 ha. The forest land affected was 5 915 ha

Comparing with the 2007 fire season, there were 79 fewer forest fires in the 2008 fire season and the damage from the fires was significantly lower.

The comparative charts for burnt area, number of fires and average fire size for the years 2007-2008 are shown in Figure 42.

The number of fires and burnt area according to types of fires for the year 2008 are shown in Figure 43.

#### *Fire fighting means and information campaign*

Fire prevention and fire fighting activities were undertaken along with a public information campaign. For the purpose of awareness raising, several media events such as press conferences, short reports and announcements on the TV and radio were organised.

Additionally, a procurement of three airplanes and 25 fire fighting vehicles was planned and organised during the year 2008.

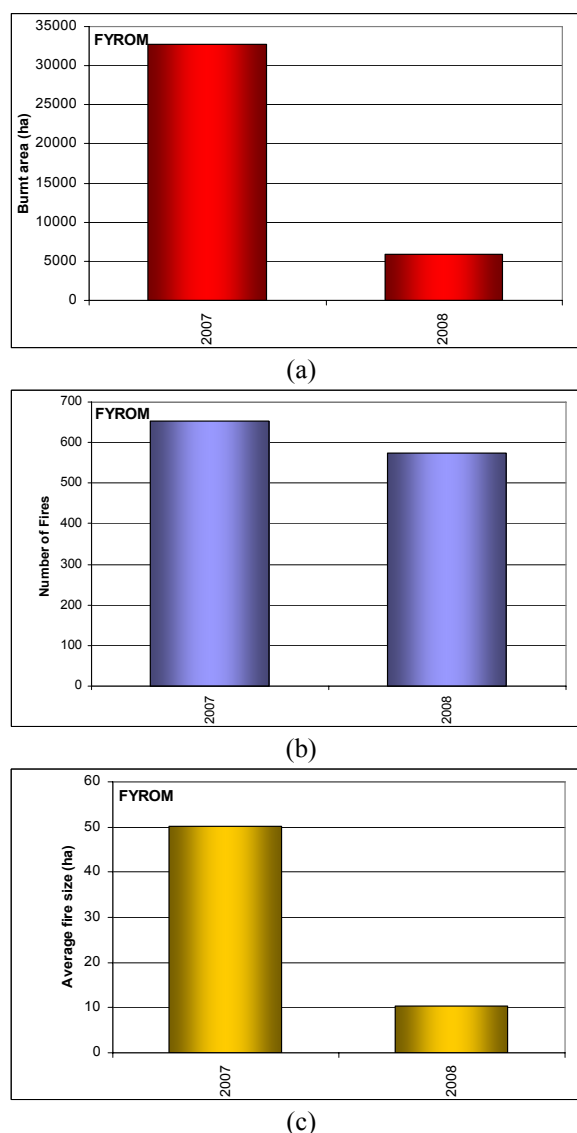


Figure 42. Burnt areas (a), number of fires (b) and average fire size (c) in FYROM in 2007 and 2008.

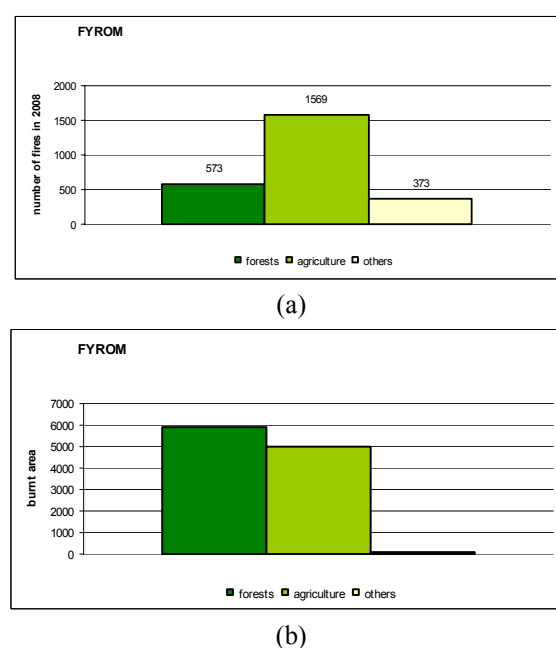


Figure 43. Number of fires (a) and burnt area (b) according to the type of fires in FYROM in 2008



### *Injuries and loss of human lives*

During the 2008 fire season 4 fire fighters were injured and 2 people lost their lives, of whom one was a civilian and one was a member of the protection and rescue forces.

(Source: Protection and rescue Directorate, Sector for analysis and research, FYROM)

## **2.2.2. Turkey**

### *Fire danger in the 2008 fire season*

The forest fire danger was high during the period June to October, and especially during the period July to August, which had very high temperatures, very low humidity and effective wind.

Forest fire is one of the most important factors that threaten forests in Turkey, a country situated in the Mediterranean Climatic Zone.

7 182 051 ha of sensitive areas were at fire danger level 1, while 5 091 788 ha of sensitive areas were at fire danger level 2 (Figure 44).

### *Fire occurrence and affected surfaces*

In Turkey 2 135 forest fires occurred in 2008, burning a total area of 29 749 ha, of which 23 577 ha were forest land.

In terms of large fires, 5 events were larger than 500 ha and there were 12 events between 100 and 500 ha.

The burnt area, number of fires and average fire size for the years 1999-2008 are shown in Figure 45.

### *Fire fighting means and information campaigns*

The following equipment was used for fire fighting: 933 fire trucks, 161 bulldozers, 144 water tanks, 128 graders, 111 trailers, 72 water tankers, 82 caravans, 366 vehicles, 717 motorcycles, 6 administration helicopters, 13 leased helicopters, 15 dromader planes, 2 CL-215 Canadair.

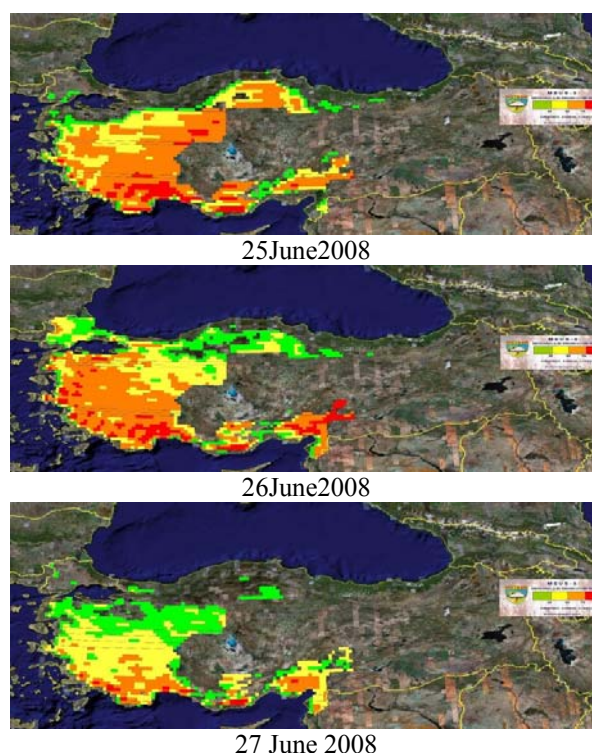


Figure 44. Fire danger level in Turkey, June 2008

The forest fire fighting strategy in Turkey is based on three basic principles:

- 1) Prevention (Education and Awareness raising)
- 2) Early warning, fast and active suppression
- 3) Rapid reforestation

1) Education and awareness raising campaigns have been carried out to increase the consideration for forest fires and particularly with the aim of:

- Making people aware about the problem of forest fires
- Training in primary schools, secondary schools and high schools
- Training the forest fire fighting teams
- Training the technical personnel
- Training the forest villagers, shepherd, and hunters
- Training the soldiers

2) For this reason, 775 fire towers were built to detect fires and report to the suppression teams. Forests are being watched from the fire towers for 24 hours during night and day.

Since 2007, The General Directorate of Forestry has controlled the deployment of all bulldozers, fire trucks, helicopters and planes using a Vehicle Tracking System.

Five fire towers in each of the two forest districts, Antalya and Muğla, tested the automatic fire finding and early warning system, which has been cooperatively developed by OGM, Bilkent University and TÜBIKAT.

For the purpose of shortening the periods of forest fire attacks in forested areas where water sources are insufficient, fire pools and ponds are being constructed.

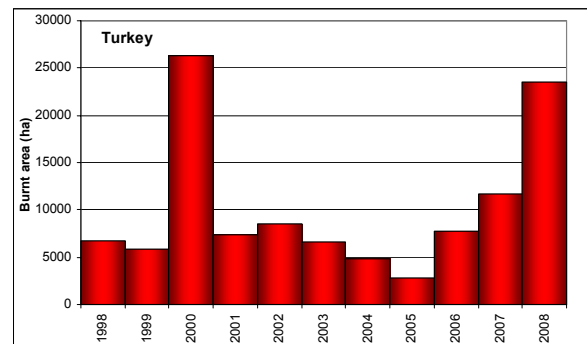


#### *Injuries and loss of human lives*

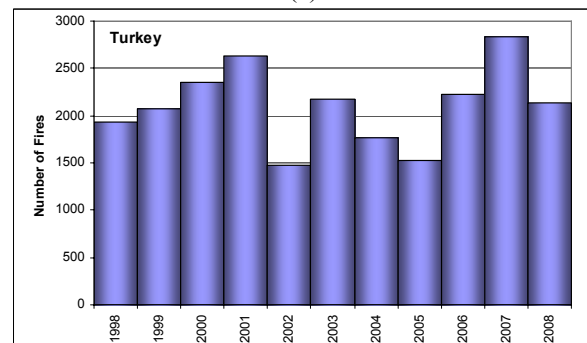
During the 2008 fire season no people lost their lives.

#### *Operations of mutual assistance*

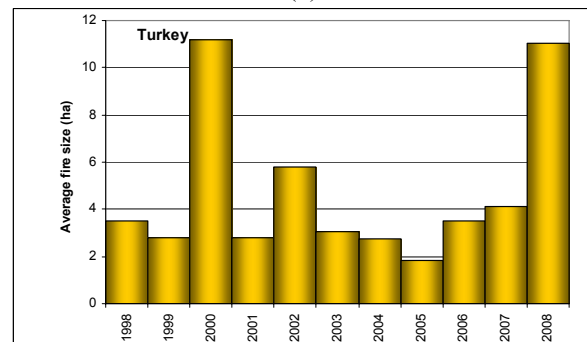
No assistance was requested in 2008.



(a)



(b)



(c)

Figure 45. Burnt areas (a), number of fires (b) and average fire size (c) in Turkey from 1998 to 2008.

(Source: General Directorate of Forestry, Forest Fires Department, Turkey)

## 2.3. OTHER EUROPEAN COUNTRIES

### 2.3.1. Switzerland

In 2008 the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) and the Swiss Federal Office for the Environment (FOEN) cooperated on organizing a centralized forest fire database for Switzerland. The database allows the officers of the 26 cantons to enter and manage their fire data through a web interface ([www.wsl.ch/swissfire](http://www.wsl.ch/swissfire)). The system makes it possible to enter and manage not only the information on fire events and related parameters, but also additional fire relevant parameters such as meteorology, land-use and land-cover information, and population on different spatial (from municipal to national level) and temporal (daily to yearly) scales. This will improve the potential for analyzing the fire occurrence with respect to the driving factors. A second web application enables single operators to easily produce periodic standard fire statistics on their own.

For 2008, fires from Canton Ticino, Grisons, Uri, Valais, Bern, Basel, Jura and Appenzell were recorded in the database. A total of 46 forest fires were registered in 2008, burning 65 hectares, which corresponds to a fairly low occurrence since 1980. Average fire size was 1.6 ha and median fire size 0.1 ha.

Half of the fires happened during the winter season (November to April), when also 3/4 of the surface was burnt.

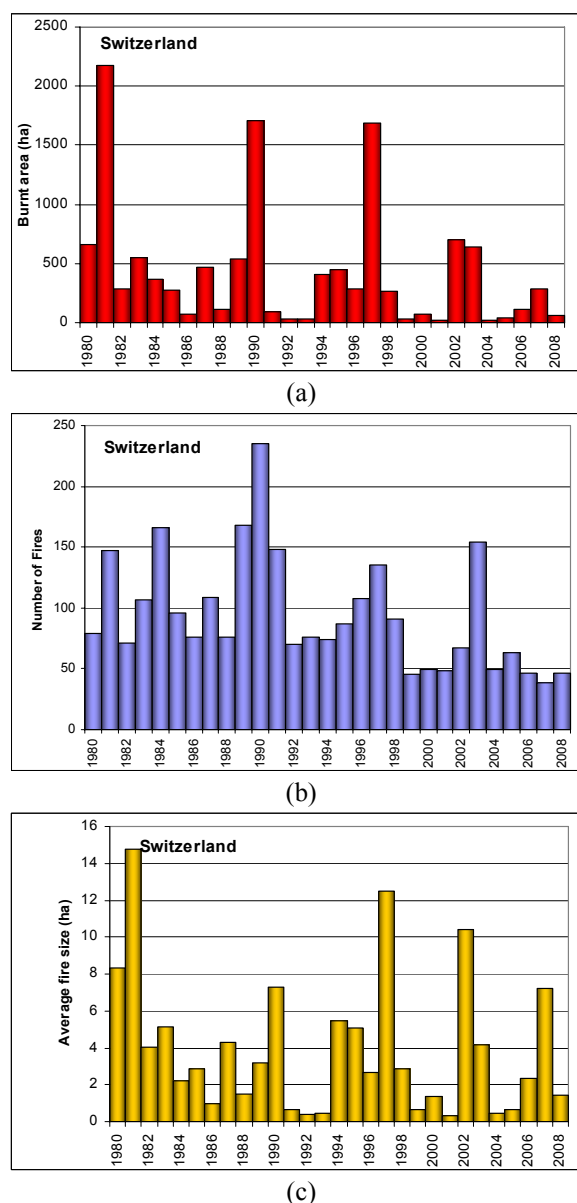


Figure 46. Burnt areas (a), number of fires (b) and average fire size (c) in Switzerland from 1980 to 2008.

(Source: Swiss Federal Institute for Forest, Snow and Landscape Research - WSL, Switzerland)

### 3. THE EUROPEAN FOREST FIRE INFORMATION SYSTEM (EFFIS)

In 1997 the European Commission set up a research group to work specifically on the development and implementation of advanced methods for the evaluation of forest fire risk and for the estimation of burnt areas in the European Union. This group is currently working as part of the Institute for Environment and Sustainability of the European Commission Joint Research Centre (JRC).

Since 1998, it has been collaborating with the relevant services in the Member States, under the coordination of DG Environment.

These activities led to the development of the European Forest Fire Information System (EFFIS). Since 2003, EFFIS has been part of Regulation (EC) No 2152/2003 (Forest Focus) of the European Council and Parliament on monitoring of forests and environmental interactions.

The purpose of EFFIS is to provide information for the protection of forests against fire in Europe addressing both pre-fire and post-fire conditions. It also centralises the national fire data that the Member States collect through the national forest fire programmes. A web mapping interface has been set up on the EFFIS website (<http://effis.jrc.ec.europa.eu>) that allows users to access EU wide information about forest fires and other related environmental data through its web mapping interface.

The EFFIS module for the assessment of meteorological forest fire risk is the EFFIS Danger Forecast developed by the JRC. The module forecasts forest fire danger in Europe on the basis of the Canadian Fire Weather Index (FWI), allowing a harmonized evaluation of the forest fire danger situation during the year. Since 2002 the danger assessment is performed for an extended period of six months and since 2005 for a period of 9 months. Therefore, also in 2008, EFFIS Danger Forecast started to evaluate forest fire danger on 1 February 2008, and ended on 31 October 2008. Forest fire danger maps were computed and broadcast to the relevant services in the Member States and the European Commission.

The JRC evaluates the annual damage caused by forest fires in Europe using the EFFIS Rapid Damage Assessment module. The evaluation focuses mainly on Southern Europe and is based on the analysis of satellite imagery and

geographic information. Since 2000, cartography of all the burned areas larger than 50 ha is produced every year through the processing of satellite imagery. The areas affected by fires of at least 50 ha correspond, on average, to 75% of the area burnt in Europe each year. Further to the mapping of burnt areas, the analysis of which types of land cover classes were affected by fires is performed. All the information is stored in a module referred to as the EFFIS Rapid Damage Assessment that replaced the old EFFIS Damage Assessment from 2004 onwards. This module uses MODIS satellite imagery with a ground spatial resolution of about 250 metres. Although initially it was meant to map fires of at least 100 or 50 ha, it was realized that even fires of 40 ha could be mapped with this system. For this reason EFFIS Damage Assessment was replaced by EFFIS Rapid Damage Assessment since 2005. With this system the evaluation of damages is performed weekly, newsletters are published at least twice during the fire campaign and the final results are included in the yearly report.

Other modules, under development within EFFIS, are looking into other aspects of forest fires such as vegetation regeneration after the fires, estimation of forest fire emissions, and the identification of post-fire risk areas that may be subject to further damages such as soil loss and/or landslides. The estimations of atmospheric emissions are already available in the EFFIS web mapping interface (<http://effis.jrc.ec.europa.eu>).

#### 3.1. EFFIS DANGER FORECAST: 2008 RESULTS

The EFFIS Danger Forecast was developed to support the Commission's Directorate-General for the Environment and the forest fire-fighting services in the EU Member States. Since 2002, at the request of the Member States, operation of the EFFIS Danger Forecast has been extended to six months starting on 1 May and ending on 31 October and in 2006 to nine months, from 1 February to 31 October.

In this chapter the fire danger trends assessed by EFFIS in the different countries during the fire season 2008 are presented, comparing them with previous years.

**In the Mediterranean region** of Europe the fire season started smoothly in the western sectors, with fire danger level in most cases below the average, also due to extended precipitation episodes in the first part of the summer. Portugal,

Spain and Italy were facing a relatively quiet beginning of the fire season.

The situation has been worsening going towards the eastern Mediterranean countries, reaching critical levels in Cyprus in the second half of June and in the island of Rhodes (Greece) in the second half of July.

Conditions were then relatively calm in August, though in Greece severe conditions were met towards the third week of the month, with significant fire activities in Crete (mid August) and in Peloponnesus. Also FYROM, Albania and Montenegro were under severe conditions in that period, while Turkey had more problems at the beginning of August. The second half of August was also particularly difficult for Bulgaria

**In Central and Northern EU regions** a sudden build up of the fire danger level from the end of May to mid June was experienced in Scandinavian and Baltic countries. In these areas critical fire danger level resulted in extreme fire events occurring in Sweden and Norway.

Fire danger was maintained quite above the average until mid July in Germany and Poland, also reaching remarkable levels in Hungary.

During the month of August the fire danger situation was significantly lowered in most areas of Central and Northern regions, remaining on average below the levels of previous years.

Through the Danger Forecast module of EFFIS the situation has been continuously monitored and the risk level analyzed and mapped.

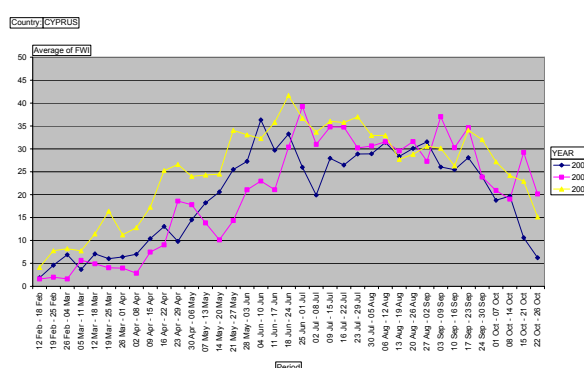
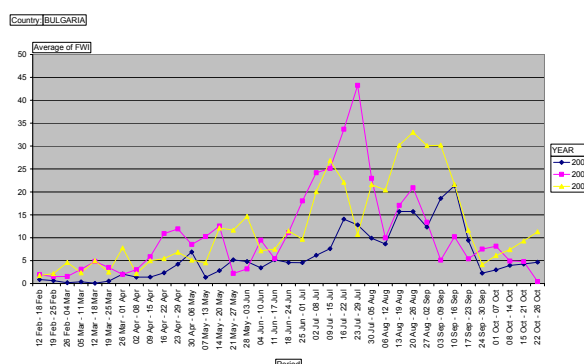
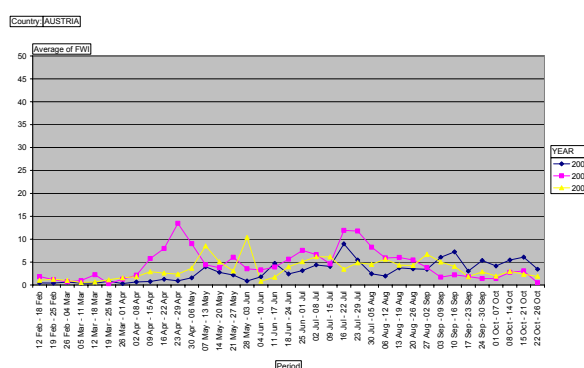
The following figures show fire danger through 2008 as determined by the average FWI values assessed during the fire season in the individual countries.

The graphs show the weekly averages of FWI over entire countries, therefore local peaks might have been flattened, especially in those countries such as France or Italy, where there are strong differences in fire danger level with changing latitudes; nevertheless the general trend is depicted providing relevant information about the fire danger level and trends of the year.

It is important to note that the algorithms and the input data to compute the daily FWI values have been modified in 2007, to better reflect the variety of conditions found in Europe as compared to Canada where the index was originally developed. Therefore the historical series of FWI values has been also recalculated and the fire danger levels revised. For this reasons the curves presented in

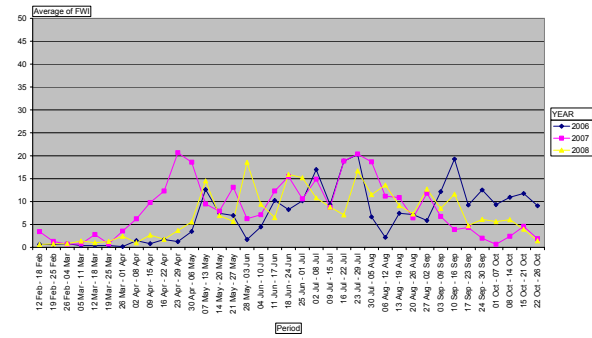
this report cannot be directly compared with the ones issued in previous years. To allow a better comparison with past seasons, the curves of 2006 and 2007 are presented in conjunction with 2008 for all countries.

The countries analyzed are those participating to the EFFIS network and are shown in alphabetic order in the graphs that follow.

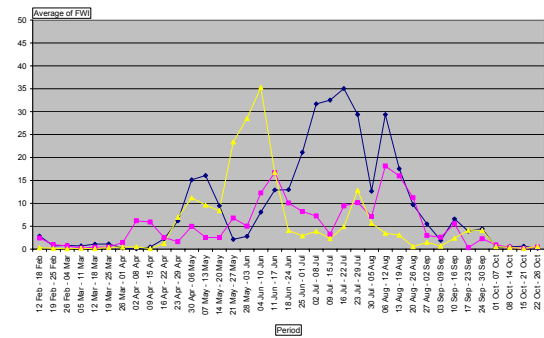




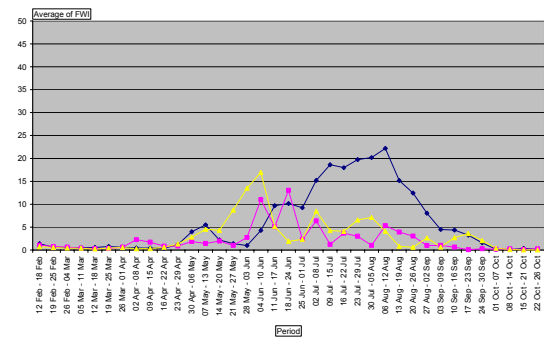
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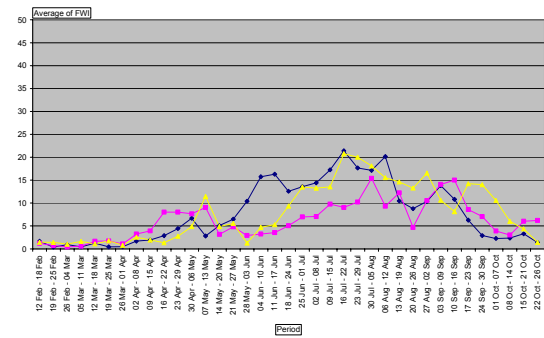
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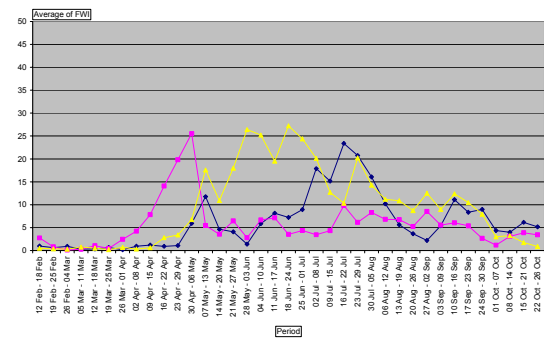
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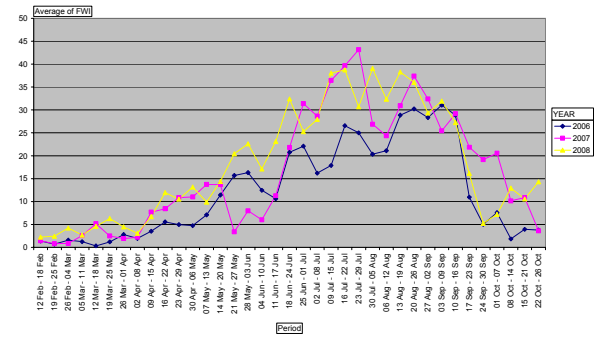
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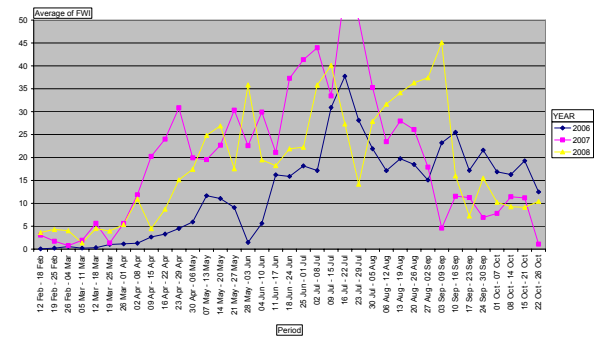
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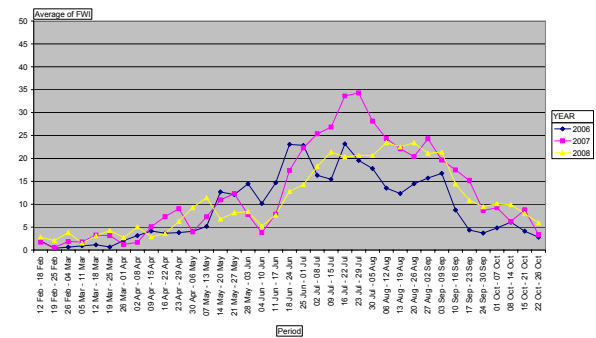
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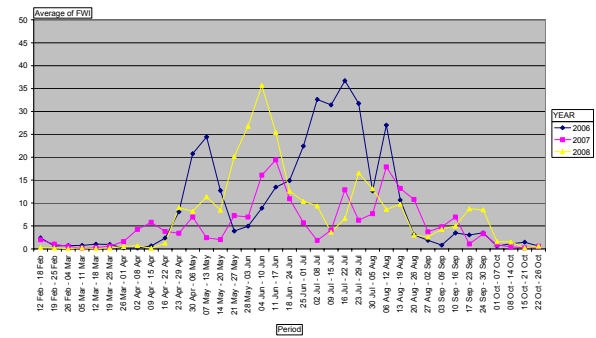
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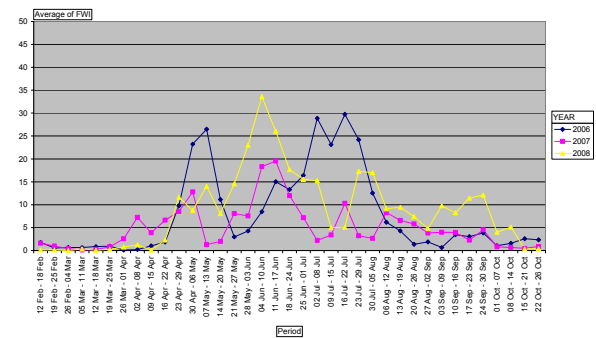
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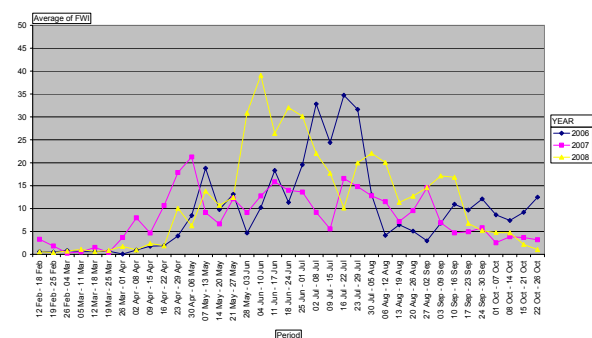
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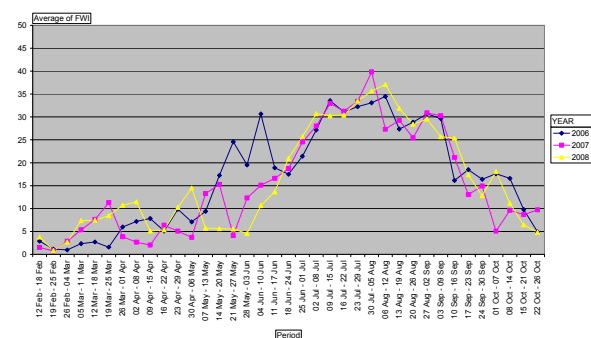
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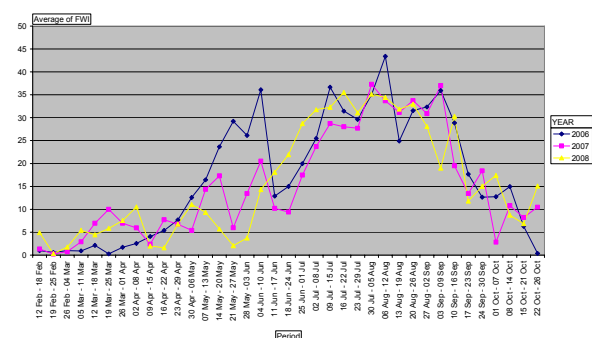
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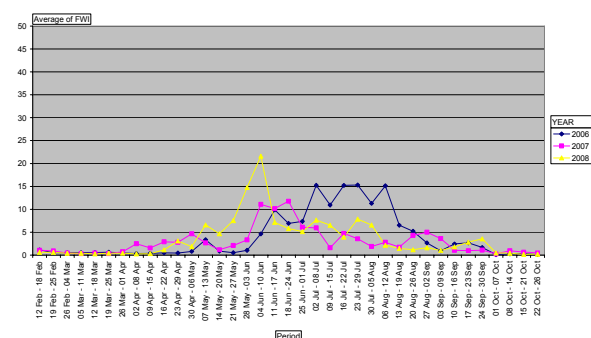
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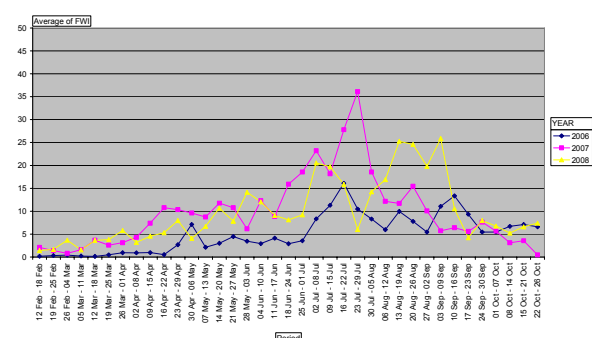
Country: PORTUGAL



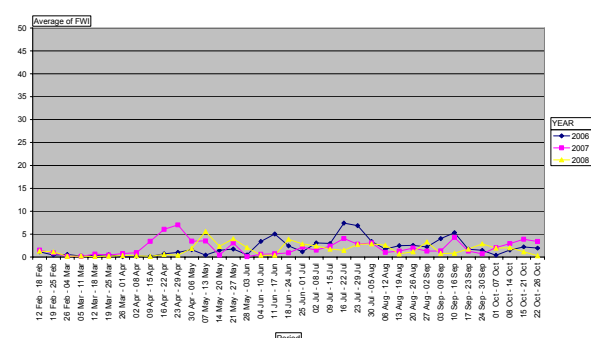
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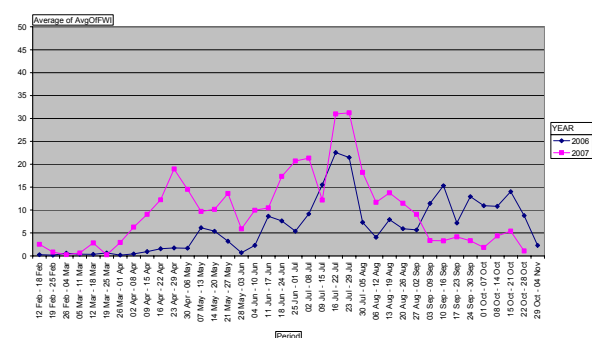
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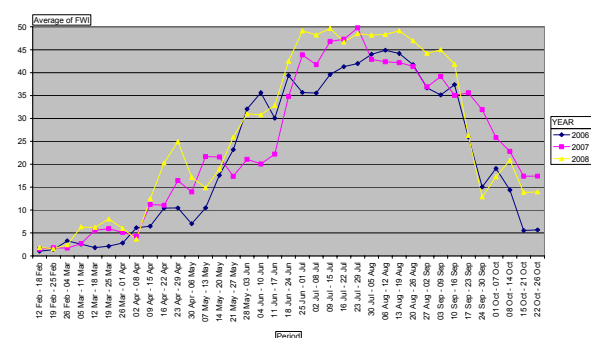
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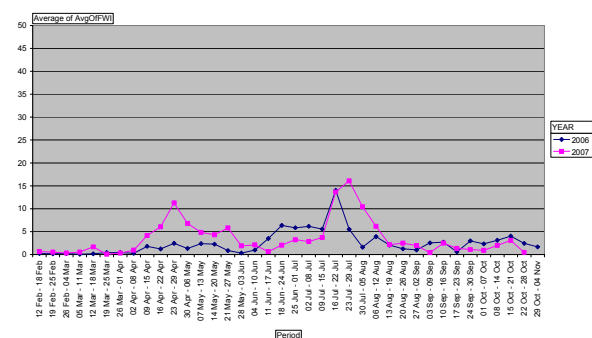
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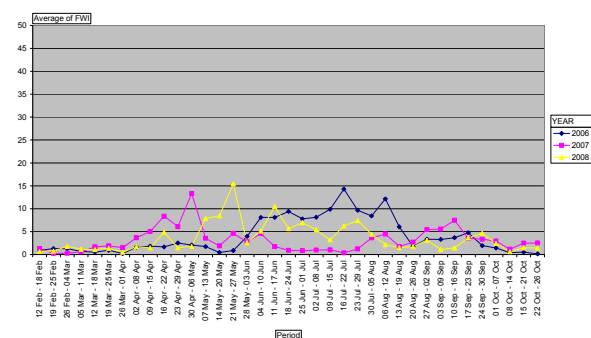
Country: TURKEY



Country: SLOVENIA



Country: UNITED KINGDOM



As mentioned previously, weekly country averages tend to flatten local fire risk peaks, which as a consequence become less evident, especially in those countries such as France or Italy, where there are strong differences in fire danger level with changing latitudes.

Therefore, to show more clearly the seasonal changes in FWI in the larger EU Mediterranean countries, i.e. Portugal, Spain, France, Italy and Greece, their territory has been further divided for fire danger reporting, according to the map shown in Figure 47. The division criteria are mainly administrative and should be taken as provisional, since other fire risk reporting sub-regions, with a specific focus on environmental criteria, might be proposed in the future.



Figure 47. Sub-country regions identified for fire danger trend reporting in five Mediterranean most affected Member States.

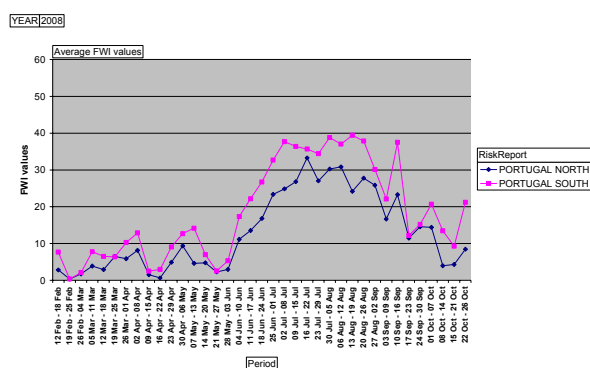


Figure 48. Fire danger trends in 2008 as determined by the Fire Weather Index (FWI) in the regions identified for Portugal

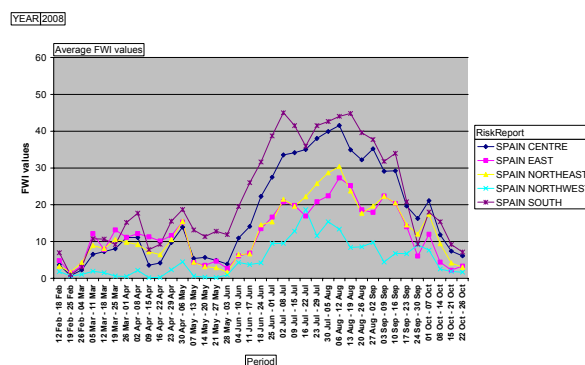


Figure 49. Fire danger trends in 2008 as determined by the Fire Weather Index (FWI) in the regions identified for Spain

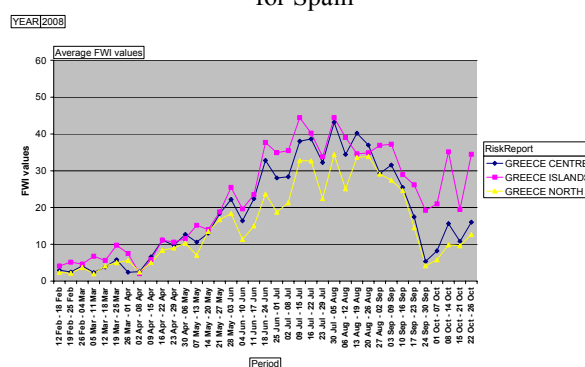


Figure 50. Fire danger trends in 2008 as determined by the Fire Weather Index (FWI) in the regions identified for Greece

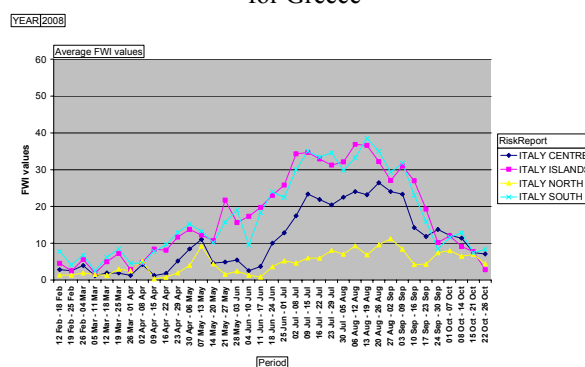


Figure 51. Fire danger trends in 2008 as determined by the Fire Weather Index (FWI) in the regions identified for Italy

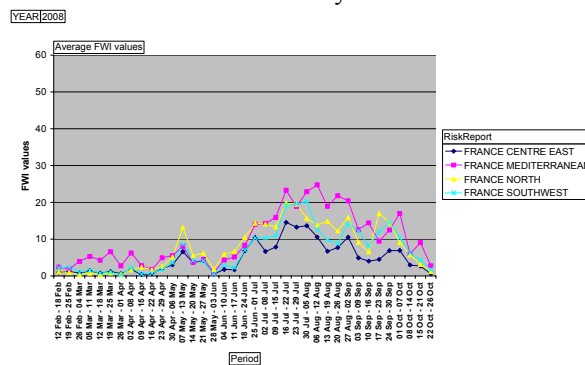


Figure 52. Fire danger trends in 2008 as determined by the Fire Weather Index (FWI) in the regions identified for France.



To facilitate the comparison among the different countries in EU, in the next graphs (Figure 53 to Figure 58), the fire danger trends as determined by FWI are shown for Member States grouped by main bioclimatic type (e.g. Mediterranean, temperate or boreal) and for Candidate countries. Data are given for 2006 to 2008.

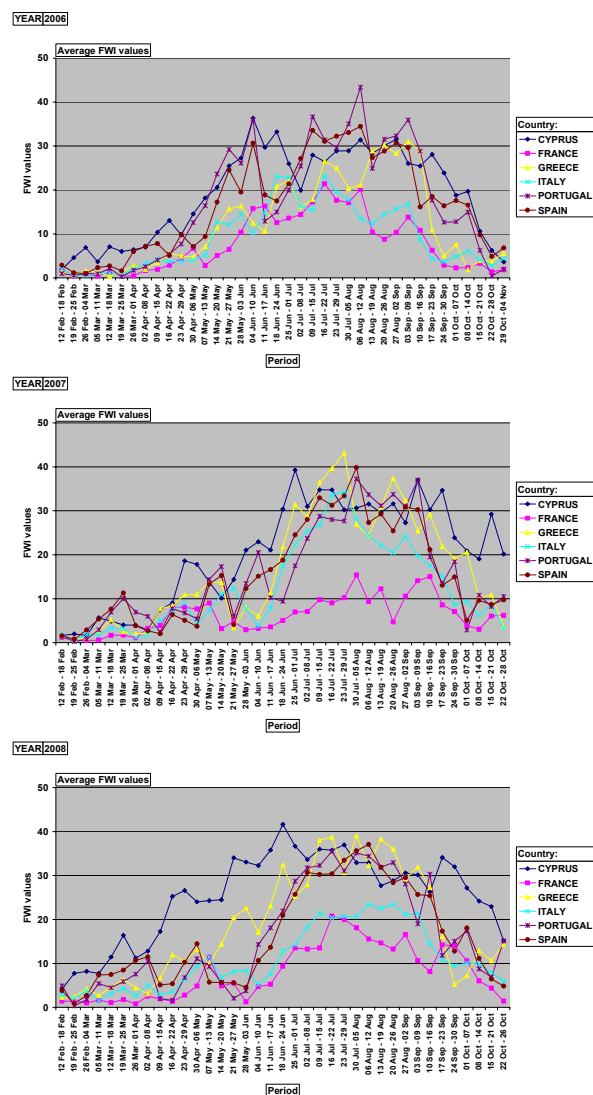


Figure 53. Fire danger trends 2006-2008 in EU Mediterranean countries (CY, FR, GR, IT, PT, ES).

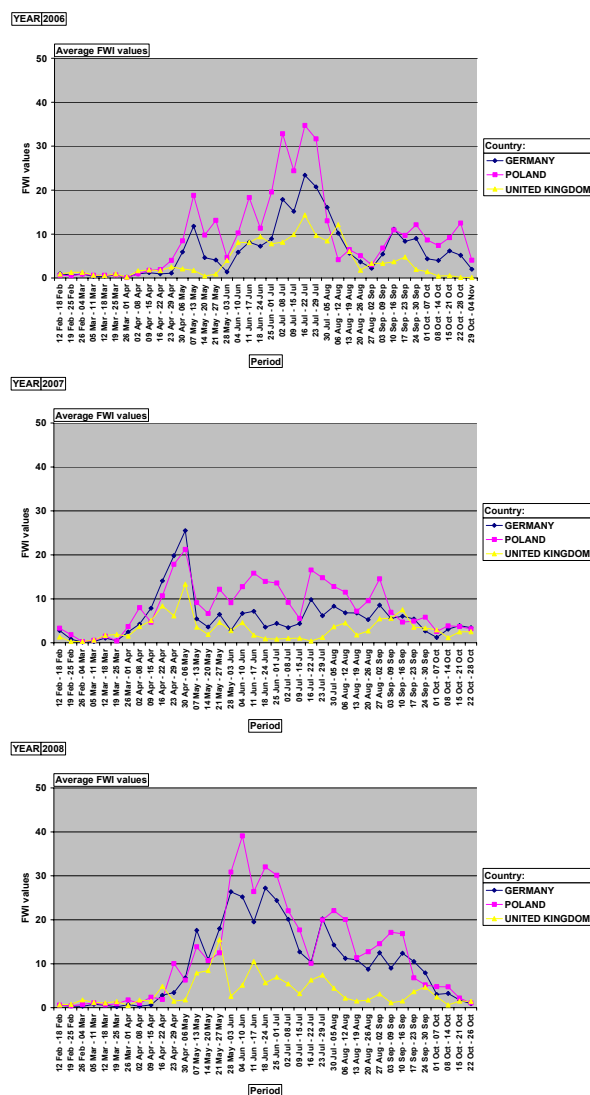


Figure 54. Fire danger trends 2006-2008 in some EU temperate countries (DE, PL, UK).

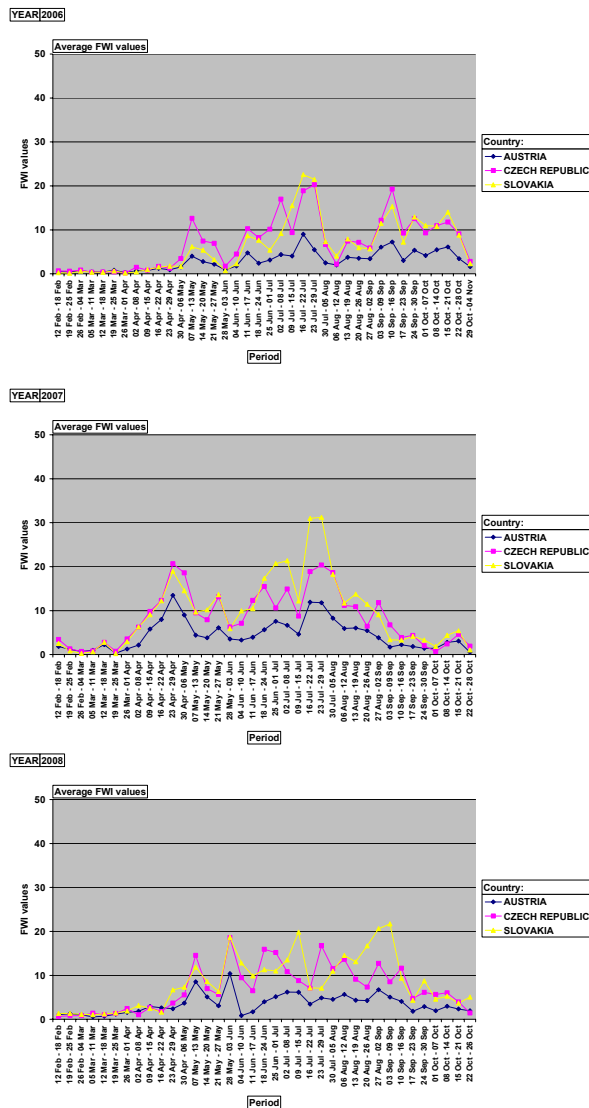


Figure 55. Fire danger trends 2006-2008 in some EU temperate countries (AT, CZ, SK).

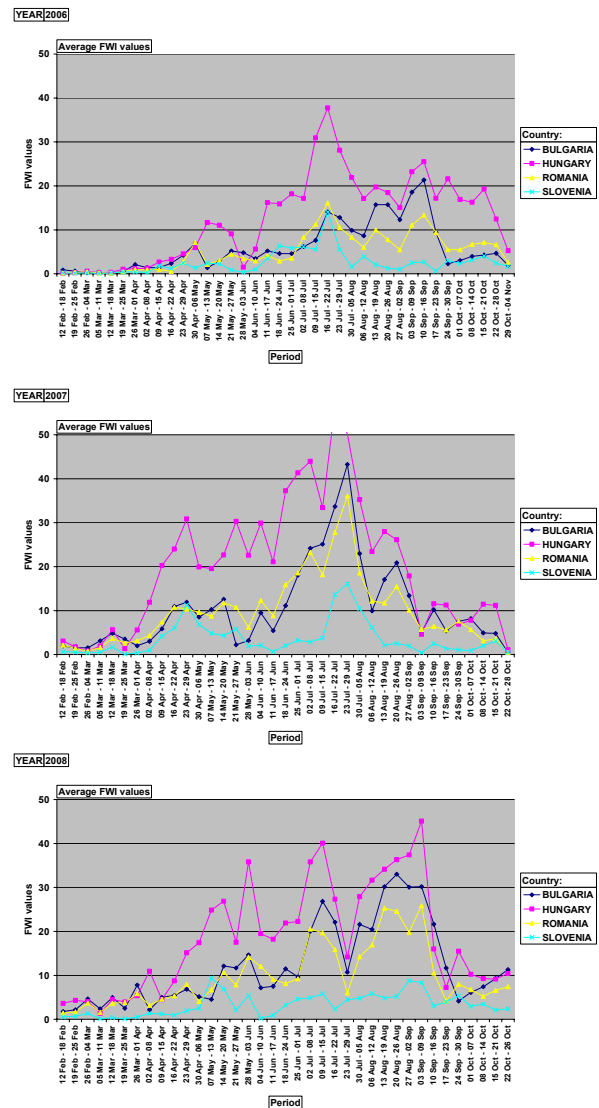


Figure 56. Fire danger trends 2006-2008 in some EU temperate countries (BG, HU, RO, SI).

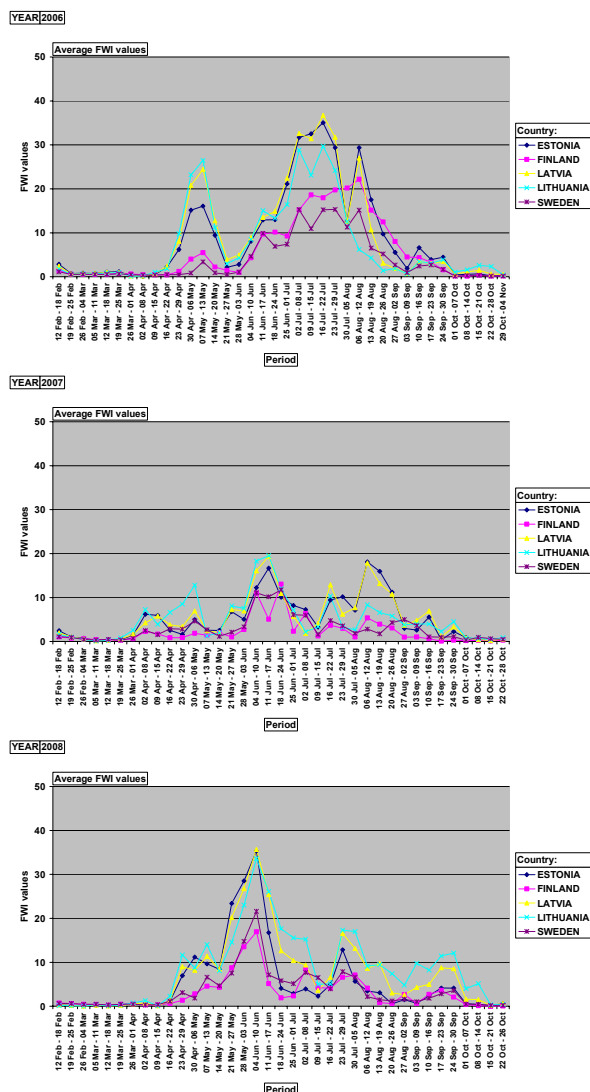


Figure 57. Fire danger trends in the last 3 years (2006-2008) in some EU boreal countries (EE, FI, LV, LT, SE).

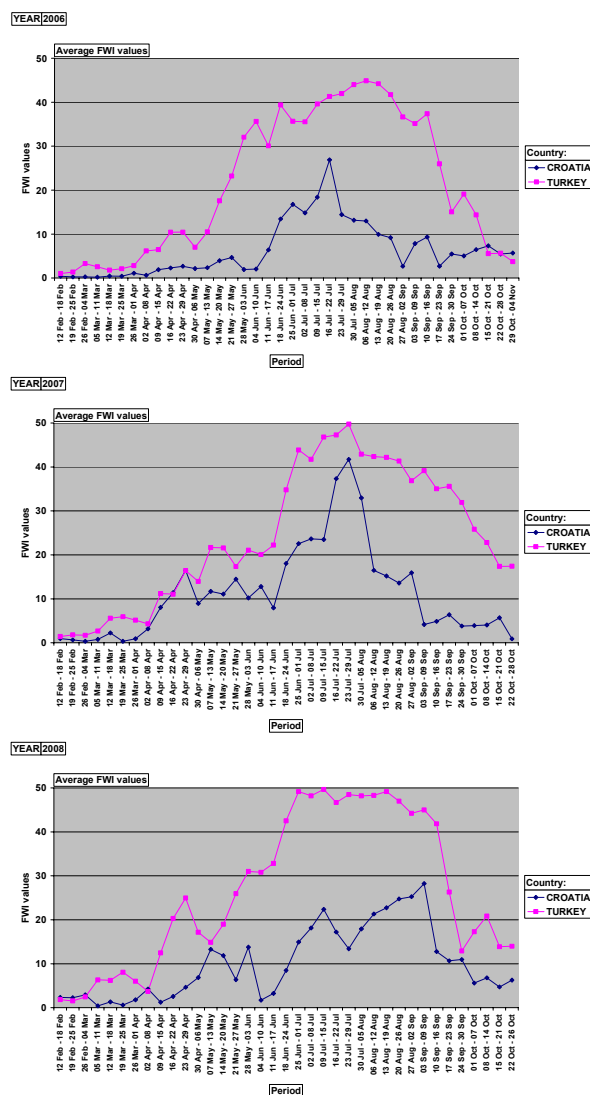


Figure 58. Fire danger trends in the last 3 years (2006-2008) in EU candidate countries.

As in previous years, the Member States gave very positive feedback on the danger assessment activity, urging that the EFFIS Danger Forecast should be continued and improved as part of the European Forest Fire Information System. This dialogue with users and other stakeholders is bound to result in an improved civil protection and forest fire service across Europe, and helps meet the EU's aim of providing environmental information and services that can be combined with other global environmental information products, in support of the Global Monitoring for Environment and Security (GMES) initiative.

### 3.2. EFFIS RAPID DAMAGE ASSESSMENT: 2008 RESULTS

The Rapid Damage Assessment module of EFFIS was set up to provide reliable and harmonized estimates of the areas affected by forest fires during the fire season. The methodology and the spatial resolution of the satellite sensor data used for this purpose allows the mapping of all fires of about 40 ha or larger. In order to obtain the statistics of the burnt area by land cover type the data from the European CORINE Land Cover 2000 (CLC) database were used. Therefore the mapped burned areas were overlaid to the CLC data, allowing the derivation of damage assessment results comparable for all the EU Countries.

EFFIS Rapid Damage Assessment is based on the analysis of MODIS satellite imagery. The MODIS instrument is on board of both the TERRA (morning pass) and AQUA (afternoon pass) satellites. MODIS data has 2 bands with spatial resolution of 250 meters (red and near-infrared bands) and 5 bands with spatial resolution of 500 meters (blue, green, and three short-wave infrared bands). Mapping of burnt areas is based mainly on the 250 meters bands, although the MODIS bands at 500 meters resolution are also used, as they provide complementary information that is used for improved burnt area discrimination. This type of satellite imagery allows detailed mapping of fires of about 50 ha or larger. Although only a fraction of the total number of fires is mapped (fires smaller than 40 ha are not mapped), the analysis of historical fire data has determined that the area burned by wildfires of this size represents in most cases the large majority of the total area burned. On average, the area burned by fires of at least 40 ha accounts for about 75% of the total area burnt every year in the Southern EU.

The results for each of the EU southern European countries mostly affected by forest fires (Portugal, Spain, France, Italy, Greece, and Cyprus) are given in the following paragraphs. In addition, an analysis for other countries in the region that had large forest

fires is also presented. Most of the large forest damages occurred in the south-eastern part of the Mediterranean region, which was under the influence of extreme weather conditions that facilitated fire ignition and spread. Overall, 2008 has been a fairly mild year in terms of the damages caused by forest fires in Europe. The country that was most heavily damaged was Turkey, followed by Greece and Italy. Detailed analysis of the fire campaign in those countries has already been presented in previous chapters of this report. The total area burned in 2008 by fires larger than 40 ha, as shown by the analysis of satellite imagery, was 156 449 ha (Table 29). These figures may include agricultural and urban areas that were also burned during the forest fires.

Table 29. Areas burned by fires of at least 40 ha in 2008 estimated from satellite imagery.

<i>Country</i>	<i>Area (Ha)</i>
Albania	19254.33
Bosnia	6961.94
Bulgaria	5731.26
Croatia	3216.60
Cyprus	1947.12
France	1694.57
FYROM	14463.18
Greece	24573.08
Italy	24449.95
Latvia	65.33
Montenegro	5771.95
Norway	2751.39
Portugal	5352.36
Serbia	629.16
Spain	10071.84
Sweden	1667.00
Turkey	27848.33
<b><i>TOTAL</i></b>	<b><i>156449.39</i></b>

Of particular interest is the analysis of the damages caused by fires to the areas protected within the Natura2000 network, as they included habitats of especial interest which are home for endangered plant and animal species. However, the category of Natura2000 areas only exists in the countries of the European Union. Information on other protected areas outside the EU is not available and is thus not presented in this

report. The area burnt within the Natura2000 sites is presented in Table 30.

Table 30. Area burnt in 2008 within Natura 2000 sites in the EU Mediterranean countries.

<i>Country</i>	<i>Area (Ha)</i>
Bulgaria	2228.02
France	1015.70
Greece	4561.20
Italy	5330.67
Portugal	838.98
Spain	4589.86
<i>TOTAL</i>	<i>18564.42</i>

Figure 59 shows the scars caused by forest fires during the 2008 season. The accumulation of burnt scars on the eastern part of the Mediterranean region, including EU and neighbour countries in the Balkans, is noticeable on this picture. Fires in northern countries such as Norway and Sweden, are also visible on this image. Although below the average values for countries like France, Portugal and Spain, some large fires also occurred in these countries during 2008.



Figure 59. Burnt scars produced by forest fires in the Mediterranean region during the fire season 2008.

### 3.2.1. Portugal

Portugal was not severely affected by forest fires in 2008. The total burned area mapped in Portugal was 5352.36 ha. From this area 838.98 ha were on Natura2000 sites, corresponding to 15.67% of the total area burned, and 0.05 % of the total Natura2000 areas in Portugal. Table 31 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 map. In terms of land cover, from a total of 5352.36 ha of burnt area mapped, 2858.61 ha of land have been burnt in forest and Other Wooded Lands, 733.22 ha were agricultural land, and 1760.52 ha in other natural lands. Some of the forest fires that affected areas in central and northern Portugal are shown in Figure 60.

Table 31. Distribution of burnt areas (fires of at least 40 ha) by land cover class in Portugal.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total burned</i>
Agricultural Areas	733.22	13.70%
Forest/Other Wooded	2858.61	53.41%
Other Natural Lands	1760.52	32.89%
<b>Total</b>	<b>5352.36</b>	<b>100.00%</b>

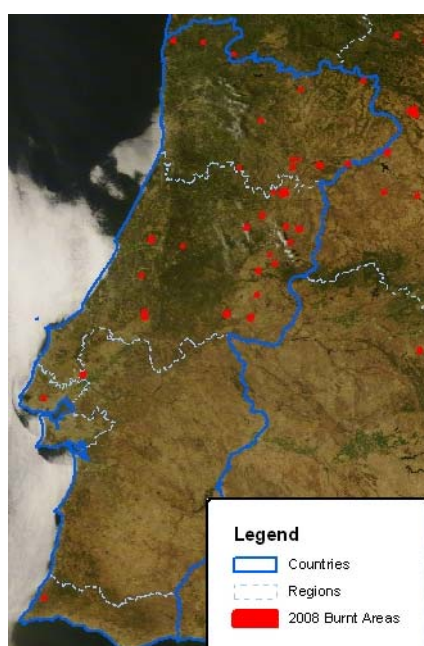


Figure 60. Impact of forest fires in Portugal.

### 3.2.2. Spain

The 2008 fire campaign was mild in Spain. Few large fire, compared to average statistics, took place in the country. The total burned area mapped in Spain was 10071.84 ha. From this area 4589.86 ha were on Natura2000 sites, corresponding to 45.57 % of the total area burned,

and 0.03 % of the Natura2000 areas in Spain. Table 32 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 database. In terms of land cover, from a total of 10071.84 ha of burnt area mapped, 6294.06 ha of land have been burnt in forests and other wooded lands, 1331.61 were other natural lands, and 2444.99 were agricultural land. Additionally, 1.17 ha burned other land cover types.

The most noticeable fires in Spain during 2008 are presented in Figure 61.



Figure 61. Impact of forest fires in Spain.

Table 32. Distribution of burned area (ha) in Spain by land cover type

<i>Land cover</i>	<i>Area burned</i>	<i>% of total burned</i>
Agricultural Areas	2444.99	24.28%
Forest/Other Wooded	6294.06	62.49%
Other Natural Lands	1331.61	13.22%
Other Land Cover	1.17	0.01%
<b>Total</b>	<b>10071.84</b>	<b>100.00%</b>

### 3.2.3. France

Very few large fires took place in France during the 2008. In fact, the total burnt area is smallest since the EFFIS system started providing statistics derived from the analysis of satellite imagery. The total burned area mapped in France was 1694.57 ha. From this area 1015.70 ha were on Natura2000 sites, corresponding to 59.94 % of the total area burned, and 0.01 of the total Natura2000 areas in the country. Table 33 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 database. In terms of land cover, from a total of 1694.12 ha



of burnt area mapped, 1130.73 ha of land have been burnt in forest and other wooded lands, 151.02 ha were agricultural land, and 408.35 ha were other natural lands. Additionally 4.48 ha of artificial surfaces, including urban, industrial and social areas, were affected by forest fires.

Table 33. Distribution of burnt areas (fires of at least 40 ha) by land cover type in France.

<i>Land cover</i>	<i>Area</i>	<i>% of total</i>
Artificial Surfaces	4.48	0.26%
Agricultural Areas	151.02	8.91%
Forest/Other Wooded	1130.73	66.73%
Other Natural Lands	408.35	24.10%
<b>Total</b>	<b>1694.57</b>	<b>100.00%</b>

The largest fires, which occurred in the southern part of France are shown in Figure 62.



Figure 62. Fires larger than 40 ha in Southern France.

### 3.2.4. Italy

The 2008 fire campaign in Italy showed a high reduction in total burnt area and also in the number of large fires that area mapped through the EFFIS Rapid Assessment System, that is, those of about 50 ha or larger. The total burned area mapped in Italy in 2008 was 24449.95 ha. From this area 5330.67 ha were on Natura2000 sites, corresponding to 21.80 % of the total area burned, and 0.09 % of the total Natura2000 area in the country. Table 34 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 database. In terms of land cover, from a total of 24449.95 ha of burnt area mapped,

8262.86 ha of land were burnt in forests and semi-other wooded lands, 8130.42 ha were agricultural land, and 7933.05 ha were other natural lands. A total of 123.62 ha of artificial areas (urban, industrial and social areas) were also affected by fires. Figure 63 shows the distribution of major forest fires in central and southern Italy, and Sardinia.



Figure 63. Burnt areas in Southern Italy.

Table 34. Distribution of burnt areas (fires of at least 40 ha) by land cover type in Italy.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total burned</i>
Artificial Surfaces	123.62	0.51%
Agricultural Areas	8130.42	33.25%
Forest/Other Wooded	8262.86	33.80%
Other Natural Lands	7933.05	32.45%
<b>Total:</b>	<b>24449.95</b>	<b>100.00%</b>

### 3.2.5. Greece

The 2008 fire campaign in Greece showed a large decrease in number of large fires, when compared to that of 2007. However, a number of large fires occurred and those were mapped in EFFIS. The total burned area mapped in Greece was 24573.08 ha. From this area 4561.20 ha were on Natura2000 sites, corresponding to 18.56 % of the total area burned and to 0.18% of the Natura2000 areas in the country. Table 35 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 map. In terms of land cover, from a total of 24573,08 ha of burnt area mapped, 17966.56 ha were forests and other wooded land, 4431.08 ha were agricultural areas, and 2133.34 ha were other natural lands. An

extension of 40.11 ha artificial areas (urban, industrial and social areas) were also burnt by forest fires.

Figure 64 shows the damages caused by forest fires in Greece, showing major fires in some of the isles (e.g Rhodes and Skyros).

Table 35. Distribution of burnt areas (fires of at least 40 ha) by land cover class in Greece.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Artificial Surfaces	40.11	0.16%
Agricultural Areas	4431.08	18.03%
Forest/Other Wooded	17966.56	73.11%
Other Natural Lands	2135.34	8.69%
<b>Total:</b>	<b>24573.08</b>	<b>100.00%</b>



Figure 64. Satellite image showing the burnt areas in Greece (in red).

### 3.2.6. Cyprus

Although Cyprus suffered a persistent drought period in 2008, the area burnt by fires larger than 50 ha was only 1947.12. These fires did not affect Natura2000 sites in the country. Table 36 presents the distribution of the mapped burnt area by land use type using the CLC 2000 database. From a total of 1947.12 ha of burnt area mapped, 1137.50 ha were forests and other wooded lands, 579.42 ha were other natural lands, and 192 ha were agricultural areas. A total of 37.83 ha of artificial areas, i.e. urban, industrial or social areas, were also affected by fires.

Table 36. Distribution of burnt areas (fires of at least 40 ha) by land cover class in Cyprus in 2008.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Artificial Surfaces	37.83	1.94%
Agricultural Areas	192.36	9.88%
Forest/Other Wooded	1137.50	58.42%
Other Natural Lands	579.42	29.76%
<b>Total:</b>	<b>1947.12</b>	<b>100.00%</b>

The areas affected by large fires are displayed in Figure 65.



Figure 65. Areas burnt by large fires (>40 ha) in Cyprus.

### 3.2.7. Bulgaria

The fire season in Bulgaria was average. Large fires mapped from satellite imagery, i.e. those affecting more than 50 ha, burnt 5731.26 ha. These fires affected protected areas such as those of the Natura2000 network, burning 2228.02 ha within these areas. Table 37 presents the distribution of the mapped burned area by land cover type using the CLC 2000 database. A total of 1760.76 ha were burnt in forests and other wooded lands and 623.58 ha were burnt in other natural lands. Fires affected a large amount of agricultural areas, burning 3344.87 ha within this type of cover, and 2.05 ha of artificial surfaces, i.e. urban, industrial or social areas.

An image showing the spatial distribution of the fires in the country is presented in Figure 66.



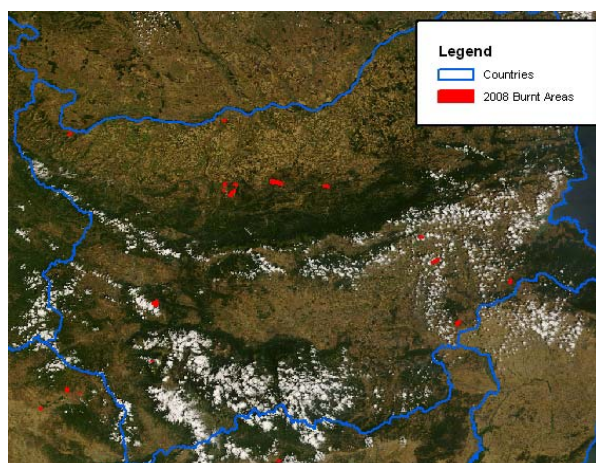


Figure 66. Forest fires in Bulgaria

Table 37. Distribution of burned area (ha) in Bulgaria by land cover types.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Artificial Surfaces	2.05	0.04%
Agricultural Areas	3344.87	58.36%
Forest/Other Wooded	1760.76	30.72%
Other Natural Lands	623.58	10.88%
<b>Total:</b>	<b>5731.26</b>	<b>100.00%</b>

### 3.2.8. Latvia

A fairly large fire of 65.33 ha took place in Latvia during the 2008 fire season. The totality of the area affected by the fire was covered by forests and other wooded land.

### 3.2.9. Sweden

The area affected by large fires in Sweden was 1667 ha. These unusually large fires affected mainly forests and other wooded land (1596.71 ha). The rest of the affected area consisted of other natural lands (68.78 ha) and other land covers (1.51 ha).

### 3.2.10. Albania

Albania was the 4<sup>th</sup> country most severely affected by forest fires in 2008. The total burnt area mapped in Albania measured from satellite imagery was 19254,33 ha, which represented a noticeable decrease in areas affected by fires, when compared to those in the 2007 fire season (over 127.000 ha). Table 38 presents the distribution of the mapped burned area by land cover type using the CLC 2000 database. A total of 11389,45 ha were burnt in forests and other wooded lands. The remaining burned area was distributed in agriculture (2080.55 ha), other

natural lands (5765.84 ha), artificial surfaces, i.e. urban, industrial or social areas (13.53 ha), and other land cover types (4.96 ha).

Figure 67 shows the burnt scars resulting from forest fires in the Albanian territory.



Figure 67. Forest fires in Albania

Table 38. Distribution of burned area (ha) in Albania by land cover types.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Artificial Surfaces	13.53	0.07%
Agricultural Areas	2080.55	10.81%
Forest/Other Wooded	11389.45	59.15%
Other Natural Lands	5765.84	29.95%
Other Land Cover	4.96	0.03%
<b>Total:</b>	<b>19254.33</b>	<b>100.00%</b>

### 3.2.11. Bosnia-Herzegovina

The 2008 fire season in Bosnia-Herzegovina was fairly mild when compared to the previous year. The total burned area mapped in the country was 6961.94 ha. Table 39 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 database. In terms of land cover, from a total of 6961.94 ha of burnt area mapped, 3911.93 ha were burnt in forests and other wooded lands, 2741.28 ha were burnt in other natural lands, while the rest, i.e. 308.73 ha were agricultural areas. Figure 68 shows the areas affected by forest fires in Bosnia-Herzegovina.



Figure 68. Burnt areas in Bosnia-Herzegovina, Croatia and Montenegro.

Table 39. Distribution of burned area (ha) in Bosnia-Herzegovina by land cover types.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total burned</i>
Agricultural Areas	308.73	4.43%
Forest/Other Wooded	3911.93	56.19%
Other Natural Lands	2741.28	39.38%
<b>Total:</b>	<b>6961.94</b>	<b>100.00%</b>

### 3.2.12. Croatia

As other countries in the south-eastern Mediterranean region, Croatia was also affected by forest fires in 2008. The total area burned mapped in Croatia measured from satellite imagery was 3216.60 ha.

Table 40 presents the distribution of the mapped burned area by land cover type using the CLC. In terms of land cover, from a total of 3216.60 ha of burnt area mapped, 2642.29 ha were forest and other wooded lands, 522.01 ha were agricultural areas, and 21.26 ha were other natural lands. Additionally, 31.04 ha were burnt in artificial areas, i.e. urban, industrial or social areas.

Visible fire scars caused by forest fires in Croatia can be observed in Figure 68 above.

Table 40. Distribution of burned area (ha) in Croatia by land cover types.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Artificial Surfaces	31.04	0.97%
Agricultural Areas	522.01	16.23%
Forest/Other Wooded	2642.29	82.15%
Other Natural Lands	21.26	0.66%
<b>Total:</b>	<b>3216.60</b>	<b>100.00%</b>

### 3.2.13. Former Yugoslav Republic of Macedonia (FYROM)

FYROM was affected by large forest fires in 2008. The total burned area mapped in FYROM by the end of the fire season was 14463.18 ha. Table 41 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 map. In terms of land cover, from a total of 14463.18 ha of burnt area mapped, 7801.12 ha were burnt in forests and other wooded lands, 2986.92 ha were other natural lands, 3671.32 ha were agricultural areas, and 3.83 ha were artificial areas (urban, industrial and social areas).

Figure 69 shows the burnt scars caused by forest fires in the country.

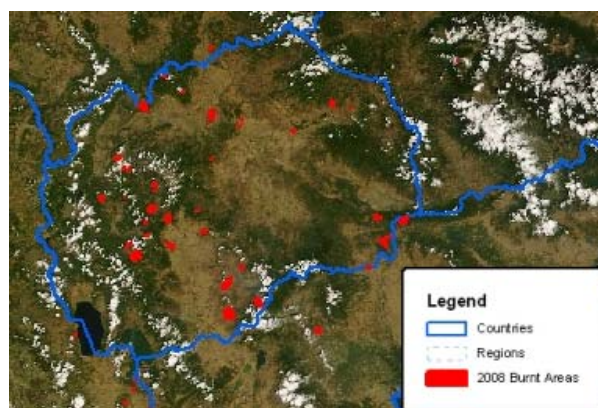


Figure 69. Burnt scars caused by forest fires in FYROM.

Table 41. Distribution of burned area (ha) by land cover types in FYROM.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Agricultural Areas	6427.01	15.96
Artificial surfaces	84.91	0.21
Forest and Semi-	33719.21	83.71
Other land types	50.94	0.13
<b>Total</b>	<b>40282.07</b>	<b>100.00</b>

### 3.2.14. Montenegro

Montenegro, as other eastern Mediterranean countries, was also affected by large forest fires in 2008. The total burned area mapped in Montenegro was 5771.95 ha.

Table 42 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 map. In terms of land cover, from a total of 5771.95 ha of burnt area mapped, 4555.35 ha of land have been burnt in forest and other wooded lands, 998.43 ha were other natural areas and 218.17 were agricultural areas. An image of the areas affected by forest fires is presented in Figure 68 above.



Table 42. Distribution of burned area (ha) in Montenegro by land cover types.

<i>Land cover</i>	<i>Area</i>	<i>% of total</i>
Agricultural Areas	218.17	3.78%
Forest/Other Wooded	4555.35	78.92%
Other Natural Lands	998.43	17.30%
<b>Total:</b>	<b>5771.95</b>	<b>100.00%</b>

### 3.2.15. Norway

A large fire of 2751.39 ha took place in Norway during 2008. Most of the area affected was covered by forests. Since CORINE land cover is not available for Norway, it is not possible to provide detail statistics of the affected land cover types. The unusual size of the fire, which caused large damages to Norwegian forest, resulted in a wide media coverage of this event.

### 3.2.16. Serbia

Very few large fires affected Serbia during the 2008 fire season. The total burnt area mapped from satellite imagery in EFFIS was 629.16 ha. Most of the areas burnt by fires were forests and other wooded lands (208.40 ha) and other natural areas (267.40 ha). Additionally, 153.35 ha of agricultural areas were affected by forest fires.

Table 43 presents the distribution of the mapped burnt area by land cover type using the CLC 2000 map. Burnt scars produced by forest fires in north and south of Serbia are shown in Figure 70.

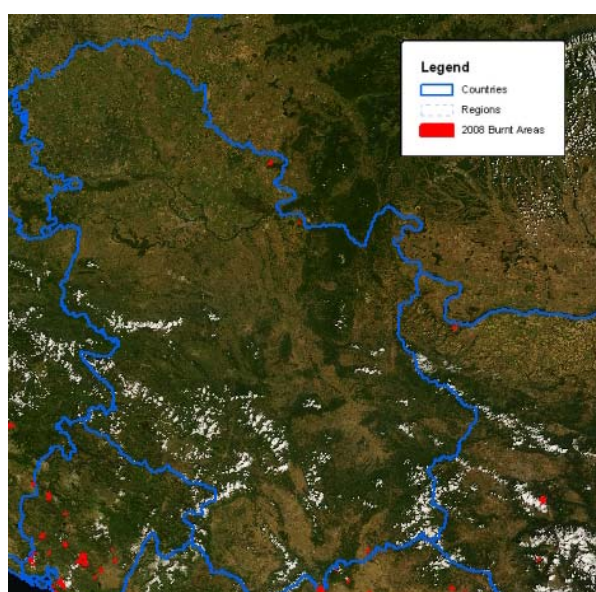


Figure 70. Burnt areas in Serbia.

Table 43. Distribution of burned area (ha) in Serbia by land cover types.

<i>Land cover</i>	<i>Area burned</i>	<i>% of total</i>
Agricultural Areas	4424.71	12.70
Artificial surfaces	0.00	0.00
Forest and Semi-	15648.88	44.93
Other land types	14756.29	42.37
Total	34829.88	100.00

### 3.2.17. Turkey

Turkey was the country most severely affected by fires larger than 50, which are mapped from MODIS satellite imagery in EFFIS. The total burnt area mapped was 27848.33 ha. Since the CORINE Land Cover database has not been yet developed in Turkey, it is not possible to provide detailed statistics on the different land cover types that were affected by fires. The largest fires took place in the eastern part of the country, north of Cyprus. A view of these fires is presented in Figure 71.

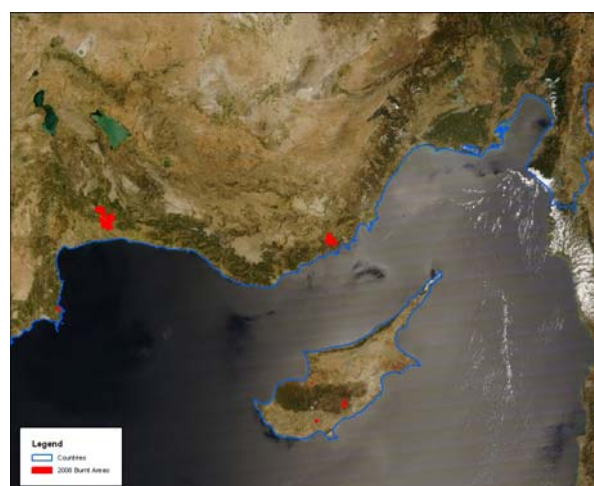


Figure 71. View of large forest fires in Turkey

### 3.3. EUROPEAN FIRE DATABASE

#### *Background*

The European Fire Database is an important component of EFFIS containing forest fire information compiled by EU Member States and the other countries members of the EFFIS network.

The first steps to create a forest fire database were taken under the **Regulation EEC No 2158/92** (now expired), which set up an action framework focussing mainly on measures for the prevention of forest fires. Under the regulation, a first forest fire information system, referred to as the Common Core Database, was established in order to collect information on forest fires, their causes and to improve the understanding of forest fires and their prevention.

Detailed rules for the application of this forest fire information system were given in the subsequent **Regulation EEC No 804/94** which made the systematic collection of a minimum set of data on each fire event a matter of routine for the Member States participating in the system. The Common Core Database covered six Member States of the Union: Germany, Portugal, Spain, France, Italy and Greece. Regulation 2158/92 was renewed for five years in 1997 and expired on 31 December 2002.

The **Forest Focus Regulation (EC) No 2152/2003** was built on the achievements of the two previous Council Regulations on the protection of Community's forests against atmospheric pollution and forest fires. According to the implementing rules of the Regulation, monitoring of forest fires in Europe continued to be recorded in order to collect comparable information on forest fires at Community level.

Since 2004 the forest fire data provided each year by individual EU Member States and other European countries have been checked, stored and managed by JRC within EFFIS. The information previously stored in the Common Core database was also transferred and the database is now known as the *European Fire Database*.

#### *Structure and collected information*

The database contains four types of information: about the time, location, size and cause of the fire (Table 44).

Before being accepted into the database, the submitted data pass through a validation phase. The checks include the following:

#### Time of fire

- Is the date valid?
- Does the date given in the file match the year given in the filename?
- Does the date/time of intervention/extinction occur after the initial date/time of alert?
- Is the duration of the fire reasonable given its size?

#### Location of fire

- Do the place names exist and are they correctly spelt?
- Are the commune name/code/NUTS codes consistent with each other?
- Is the correct (up to date) code used?
- If information is missing, is it possible to obtain it from cross-referring other data?
- If North/East values are given, are they plausible?

#### Size of fire

- Are the values plausible (e.g.. correct units)?
- Have the categories (Forest, Non-forest, etc) been assigned correctly?

#### Cause of fire

- Is the mapping between the country cause code and EU code consistent/correct?

#### *Data stored in the database*

The database now contains fire data from 21 countries: Bulgaria, Croatia, Cyprus, Czech, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland and Turkey, and comprises around 1.8 million individual fire event records (1.5 million forest fires). See Table 45 for a summary.

#### *Access to the information*

Access to summarised information from the database is available through EFFIS web interface (<http://effis.jrc.ec.europa.eu/fire-history>), which allows the users to retrieve general information

such as maps of the number of fires, burnt area and average fire size for a selected year and for the countries for which data are available (Figure 72).

The data can be displayed at country, NUTS1, NUTS2 or NUTS3 level and may be filtered to exclude fires below a certain size. Further analysis possibilities are planned for the future.

Table 44. Information collected for each fire event

ID	Unique Fire identifier	FIREID
TIME OF FIRE	Date of first alert [YYYYMMDD]	DATEAL
	Time of first alert [HHMM]	TIMEAL
	Date of first intervention [YYYYMMDD]	DATEIN
	Time of first intervention [HHMM]	TIMEIN
	Date of fire extinction [YYYYMMDD]	DATEEX
	Time of fire extinction [HHMM]	TIMEEX
LOCATION OF FIRE	Province Code (national nomenclature)	PROVCODE
	NUTS3 code	NUTS3
	Commune Code (national nomenclature)	CODECOM
	Commune Name (national nomenclature)	NAMECOM
	Latitude [decimal degrees]	NORTH
	Longitude [decimal degrees]	EAST
SIZE OF FIRE (Ha)	Burned Area FOREST	BAFOR
	Burned Area OTHER WOODED LAND	BAOW
	Burned Area OTHER NON WOODED NATURAL LAND	BAONW
	Burned Area AGRICULTURE AND OTHER ARTIFICIAL LAND	BAAGR
CAUSE OF FIRE	Presumed Cause (EU categories code)	CAUSE EU
	Presumed Cause (Country detailed categories code)	CAUSE CO

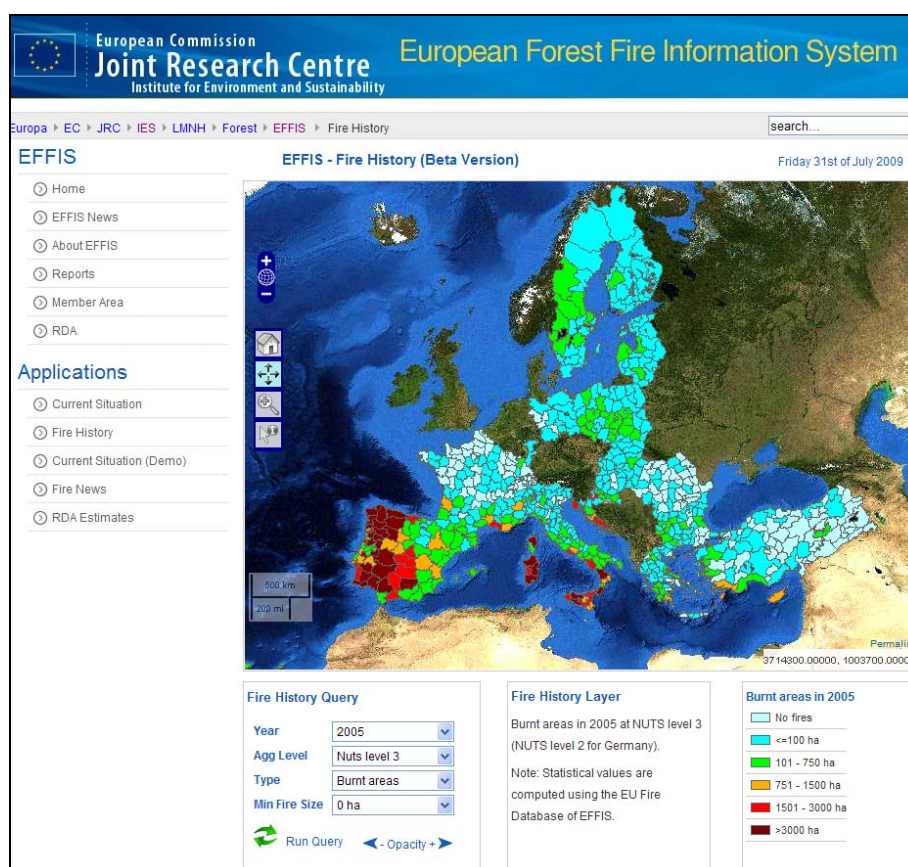


Figure 72. Access to the information stored in the European Fire Database from EFFIS web interface

Table 45. Summary of data records stored in the EU Fire Database

COUNTRY	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria																										251	393	1479
Croatia																	3147	3795	5485	3856	7897	4045	4713	6937	2859	3372	3581	5176
Cyprus																					285	299	243	427	221	185	172	111
Czech rep.																									3 <sup>†</sup>	1 <sup>†</sup>	697	
Estonia																										65	248	64
Finland																									2285	2721	6406	2918
France						3732	2657	2116	2240	3321	3297	2372	2708	4766	4728	6539	6401	8001	6289	4881	4343	4259	4097	7023	3767	4698	4608	3382
Germany															706	525	822	276	592	794	930	373	278	1238	300	299	717	435
Greece				945	1184	1417	1088	1234	1798	1203	1283	1036	2008	2707	1955	1494	1527	2271	605	513	1469	1313	572	622	739	718*	764*	1226*
Hungary																							429	373	104	150	97	603
Italy						12931	6115	8506	9785	8328	11560	7580	10044	14317	7153	5505	6064	11608	9565	6956	8609	7227	4607	9717	6340	7919	5653	10736
Latvia																									647	365	1929	426
Lithuania																									430	267	1444	245
Poland														17808	24365	23822	23587	25070	21348	32650	31811	24513	38154	79022	36320	46546	35634	31303
Portugal	2349	6730	3626	4542	7356	8441	5036	7705	6131	21896	10745	14327	14954	16101	19983	34116	28626	23497	34676	25477	34109	26942	26498	26195	21952	35699	19929	19024
Romania																									34	64	105	478
Slovakia																									153	287	238	463
Spain						12235	7514	8816	9440	20250	12914	13529	15956	14253	19249	25557	16586	22320	22003	17943	23574	19099	19929	18616	21396	25492	16334	10932
Sweden																	4854	7057	2503	4707	4708	4831	6490	8282	4955	4573	4618	3787
Switzerland	79	147	71	107	166	96	76	109	76	168	235	148	70	76	74	87	108	135	91	45	49	48	67	155	49	63	46	65
Turkey																										1530	2227	2706*

2008 data are still undergoing validation checks and are not presented

\* Data undergoing further validation – final count may change

† Only includes fires >10ha

**NB.** The totals given in this table do not always match the published number of fires for a number of reasons:

1. Purely agricultural fires are stored in the database if submitted by the country, but are excluded from forest fire calculations
2. Some countries do not report detailed records for the whole of their territory and this information is only available in summary form

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## ANNEX I – SUMMARY TABLES OF FIRE STATISTICS

Table 46. Number of forest fires in five Southern Member States (1980-2008)

<i>Year</i>	<i>PORTUGAL</i>	<i>SPAIN</i>	<i>FRANCE</i>	<i>ITALY</i>	<i>GREECE</i>	<i>TOTAL</i>
1980	2 349	7 190	5 040	11 963	1 207	27 749
1981	6 730	10 878	5 173	14 503	1 159	38 443
1982	3 626	6 545	5 308	9 557	1 045	26 081
1983	4 539	4 791	4 659	7 956	968	22 913
1984	7 356	7 203	5 672	8 482	1 284	29 997
1985	8 441	12 238	6 249	18 664	1 442	47 034
1986	5 036	7 570	4 353	9 398	1 082	27 439
1987	7 705	8 679	3 043	11 972	1 266	32 665
1988	6 131	9 247	2 837	13 588	1 898	33 701
1989	21 896	20 811	6 763	9 669	1 284	60 423
1990	10 745	12 913	5 881	14 477	1 322	45 338
1991	14 327	13 531	3 888	11 965	858	44 569
1992	14 954	15 955	4 002	14 641	2 582	52 134
1993	16 101	14 254	4 769	14 412	2 406	51 942
1994	19 983	19 263	4 618	11 588	1 763	57 215
1995	34 116	25 827	6 563	7 378	1 438	75 322
1996	28 626	16 771	6 401	9 093	1 508	62 399
1997	23 497	22 320	8 005	11 612	2 273	67 707
1998	34 676	22 446	6 289	9 540	1 842	74 793
1999	25 477	18 237	4 960	6 932	1 486	57 092
2000	34 109	24 118	4 603	8 595	2 581	74 006
2001	26 533	19 547	4 309	7 134	2 535	60 058
2002	26 488	19 929	4 097	4 601	1 141	56 256
2003	26 195	18 616	7 023	9 697	1 452	62 983
2004	21 870	21 394	3 775	6 428	1 748	55 215
2005	35 697	25 492	4 698	7 951	1 544	75 382
2006	19 929	16 355	4 608	5 634	1 417	47 943
2007	18 722	10 915	3 364	10 639	1 983	45 623
2008	13 832	11 612	2 781	6 486	1 481*	36 192
% of total in 2008	38%	32%	8%	18%	4%	100%
Average 1980-1989	7 381	9 515	4 910	11 575	1 264	34 645
Average 1990-1999	22 250	18 152	5 538	11 164	1 748	58 851
Average 2000-2008	24 819	18 664	4 362	7 463	1 765	57 073
Average 1980-2008	17 920	15 333	4 956	10 157	1 586	49 952
TOTAL	519 686	444 647	143 731	294 555	45 995	1 448 614

\* Provisional data



**Table 47. Burnt area (hectares) in five Southern Member States (1980 – 2008)**

<i>Year</i>	<i>PORTUGAL</i>	<i>SPAIN</i>	<i>FRANCE</i>	<i>ITALY</i>	<i>GREECE</i>	<i>TOTAL</i>
1980	44 251	263 017	22 176	143 919	32 965	506 328
1981	89 798	298 288	27 711	229 850	81 417	727 064
1982	39 556	152 903	55 145	130 456	27 372	405 432
1983	47 811	108 100	53 729	212 678	19 613	441 931
1984	52 710	165 119	27 202	75 272	33 655	353 958
1985	146 254	484 476	57 368	190 640	105 450	984 188
1986	89 522	264 887	51 860	86 420	24 514	517 203
1987	76 269	146 662	14 108	120 697	46 315	404 051
1988	22 434	137 734	6 701	186 405	110 501	463 775
1989	126 237	426 693	75 566	95 161	42 363	766 020
1990	137 252	203 032	72 625	195 319	38 594	646 822
1991	182 486	260 318	10 130	99 860	13 046	565 840
1992	57 011	105 277	16 593	105 692	71 410	355 983
1993	49 963	89 267	16 698	203 749	54 049	413 726
1994	77 323	437 635	24 995	136 334	57 908	734 195
1995	169 612	143 484	18 137	48 884	27 202	407 319
1996	88 867	59 814	11 400	57 988	25 310	243 379
1997	30 535	98 503	21 581	111 230	52 373	314 222
1998	158 369	133 643	19 282	155 553	92 901	559 748
1999	70 613	82 217	15 906	71 117	8 289	248 142
2000	159 605	188 586	24 078	114 648	145 033	631 950
2001	111 850	93 297	20 642	76 427	18 221	320 437
2002	124 411	107 464	30 160	40 791	6 013	308 839
2003	425 726	148 172	73 278	91 805	3 517	742 498
2004	129 539	134 193	13 711	60 176	10 267	347 886
2005	338 262	188 697	22 135	47 575	6 437	603 106
2006	75 510	148 827	7 844	39 946	12 661	284 788
2007	31 450	82 048	8 570	227 729	225 734	575 531
2008	17 244	39 895	6 001	66 329	29 152*	158 621
<i>% of total in 2008</i>	11%	25%	4%	42%	18%	100%
<i>Average 1980-1989</i>	73 484	244 788	39 157	147 150	52 417	556 995
<i>Average 1990-1999</i>	102 203	161 319	22 735	118 573	44 108	448 938
<i>Average 2000-2008</i>	157 066	125 687	229 35	85 047	50 782	441 517
<i>Average 1980-2008</i>	109 327	179 043	28 460	118 022	49 044	483 896
<i>TOTAL</i>	3 170 470	5 192 248	825 332	3 422 650	1 422 282	14 032 982

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\* Provisional data

**Table 48. Number of forest fires in other European countries (1990-2008)**

<i>Country</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>
<i>Austria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	954	912	750	-
<i>Bulgaria</i>		73	602	1 196	667	114	246	200	578	320	1 710	825	402	452	294	241	393	1 479	582
<i>Croatia</i>	-	-	-	-	-	-	-	-	-	-	7 797	4 024	4 692	6 923	2 853	3 368	3 571	5 176	-
<i>Cyprus</i>	-	-	-	-	-	-	-	-	-	-	285	299	243	427	221	185	172	111	114
<i>Czech Rep.</i>	-	-	-	-	-	1 331	1 421	1 398	2 563	1 402	1 499	483	604	1 754	873	619	697	-	-
<i>Estonia</i>	-	-	-	-	-	-	-	-	-	-	-	-	356	111	89	65	248	64	71
<i>Finland</i>	-	-	-	-	-	-	1 475	1 585	370	1 528	806	796	2 489	1 707	783	1 069	3 046	1 204	1 451
<i>FYROM</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	652	573
<i>Germany</i>	-	1 846	3 012	1 694	1 696	1 237	1 748	1 467	1 032	1 178	1 210	587	513	2 524	626	496	930	779	818
<i>Hungary</i>	-	-	-	-	-	-	-	-	-	229	811	419	382	375	104	150	97	603	502
<i>Latvia</i>	604	225	1 510	965	763	582	1 095	768	357	1 196	915	272	1 720	900	647	365	1 929	425	700
<i>Lithuania</i>	-	-	1 180	634	715	472	894	565	258	1 022	654	287	1 596	885	468	301	1 545	251	301
<i>Poland</i>	5 756	3 528	11 858	8 821	10 710	7 681	7 924	6 818	6 166	9 820	12 428	4 480	10 101	17 088	7 219	12 803	11 828	8 305	9 091
<i>Romania</i>	131	42	187	159	121	62	72	37	59	138	688	268	516	203	34	64	105	478	91
<i>Slovakia</i>	-	-	-	-	366	254	662	535	1 056	426	824	311	570	872	153	287	237	463	182
<i>Slovenia</i>	-	-	-	-	-	-	-	-	-	-	-	-	60	224	51	73	112	140	74
<i>Sweden</i>	-	-	-	-	-	-	4 854	7 057	2 503	4 707	4 708	4 831	6 490	8 282	4 955	4 573	4 618	3 737	5 420
<i>Switzerland</i>	235	148	70	76	74	87	108	135	91	45	49	48	67	154	49	63	46	39	46
<i>Turkey</i>	-	-	-	-	-	-	-	-	1 932	2 075	2 353	2 631	1 471	2 177	1 762	1 530	2 227	2 829	2 135

**Table 49. Burnt area (hectares) in other European countries (1990 – 2008)**

<i>Country</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>
<i>Austria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74	75	48	-
<i>Bulgaria</i>	-	511	5 243	18 164	18 100	550	906	595	6 967	8 291	57 406	20 152	6 513	5 000	1 137	1 456	3 540	42 999	5 289
<i>Croatia</i>	-	-	-	-	-	-	-	-	-	-	129 883	27 251	74 945	77 359	8 988	21 407	18 782	63 719	-
<i>Cyprus</i>	-	-	-	-	-	-	-	-	-	-	8 034	4 830	2 196	2 349	1 218	1 838	1 160	4 483	2 392
<i>Czech Rep.</i>	-	-	-	-	-	403	2 043	359	1 132	336	375	87	178	1 236	335	227	53	-	-
<i>Estonia</i>	-	-	-	-	-	-	-	-	-	-	-	-	2 082	207	379	87	2 638	292	1 280
<i>Finland</i>	-	-	-	-	-	-	433	1 146	131	609	262	174	584	664	351	495	1 617	576	824
<i>FYROM</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32 665	5 915
<i>Germany</i>	-	920	4 908	1 493	1 114	592	1 381	599	397	415	581	122	122	1 315	274	183	482	256	538
<i>Hungary</i>	-	-	-	-	-	-	-	-	-	756	1 595	-	1 227	845	247	3 531	625	4 636	2 404
<i>Latvia</i>	258	69	8 412	570	326	535	927	448	211	1 544	1 341	311	2 222	559	486	120	3 387	272	364
<i>Lithuania</i>	-	-	769	274	279	321	478	226	93	494	352	113	746	436	253	51	1 199	38	112
<i>Poland</i>	7 341	2 567	43 755	8 290	9 171	5 306	14 120	6 598	4 019	8 307	7 013	3 429	5 593	28 554	4 338	7 387	5 912	2 844	3 028
<i>Romania</i>	444	277	729	518	312	208	227	68	137	379	3607	1001	3536	762	124	162	946	2529	373
<i>Slovakia</i>	-	-	-	-	-	-	-	-	-	557	904	305	595	1 567	157	524	280	679	118
<i>Slovenia</i>	-	-	-	-	-	-	-	-	-	-	-	-	161	2 100	138	280	1 420	128	75
<i>Sweden</i>	-	-	-	-	-	-	1 588	5 873	422	1 771	1 552	1 254	2 626	4 002	1 883	1 562	5 710	1 090	4 280
<i>Switzerland</i>	1 705	96	27	34	404	444	286	1 685	261	30	68	17	697	640	23	41	108	282	65
<i>Turkey</i>	-	-	-	-	-	-	-	-	6 764	5 804	26 353	7 394	8 513	6 644	4 876	2 821	7 762	11 664	23 577



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**Abstract**

This is the 9<sup>th</sup> “Forest Fires in Europe” report published by the European Commission. The report contains a summary of the 2008 fire season in Europe, with official statistics on number of fires and burned areas compiled by the contributing countries. In addition to country reports with a summary of the past fire season provided by the countries, the report Forest Fires in Europe informs about the latest developments in terms of forest fire prevention and initiatives of the European Commission to support forest fires fire protection activities in the European Union. Furthermore it provides the results of the European Forest Fire Information System (EFFIS) operating during the fire season, with special emphasis on the EFFIS Danger Forecast, providing daily maps of meteorological fire danger forecast of EU, and the EFFIS Rapid Damage Assessment, performing the daily mapping and assessment of main land cover and Natura2000 areas affected by fires of at least 40 ha during the fire season.





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